

# IFP

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**MARCH 2014**  
**Issue 57**



Front Cover: Frozen Sprinkler. Picture Courtesy of Koffel & Associates

#### Publishers

Mark Seton & David Staddon

#### Group Editor

Graham Collins

#### Editorial Contributors

Kathleen Almand, Wilf Butcher, Fred Hildebrandt, Graham Collins, William E. Koffel, Daniel Brosch, Paul Greigger, Jim Spowart, Marijan Kamenjašević, Jessica Paling, Simon Ince, John Connors, Sean Appleton, Francisco Joglar, Kevin Honner

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MDM Publishing Ltd  
The Abbey Manor Business Centre,  
The Abbey, Preston Road,  
Yeovil, Somerset BA20 2EN

Tel: +44 (0) 1935 426 428

Fax: +44 (0) 1935 426 926

Email: dave.staddon@ifpmag.com

website: www.mdmpublishing.com

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# QuickZone

## The Advanced Conventional Fire System



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#### Dubai Office

Dubai Airport Free Zone, Building W3,

Office 211, Dubai UAE

**Tel:** +971 4 299 0908

**Fax:** +971 4 299 0554

#### UK and EMEAA HQ

Moorland Way, Cramlington,  
Northumberland, NE23 1WE UK

**Tel:** +44 (0)1670 707 111

**Fax:** +44 (0)1670 707 222



**Email:** [sales@advancedco.com](mailto:sales@advancedco.com) **Web:** [www.advancedco.com](http://www.advancedco.com)



Graham Collins

Email: [graham.collins@mdmpublishing.com](mailto:graham.collins@mdmpublishing.com)

# What's in a Word?

I have used it, you have used it; every newspaper, TV station, politician and pundit has used it. But what do we really mean by Sustainable? It seems to have been bandied about so much that I am not at all sure that we have not lost a real understanding of what it means and what it is all about. And the fire protection industry is no exception, often pirating the word and attaching it to a multitude of claims in the hope the word alone will engender a belief that the product being described must be okay.

But what does the word sustainable mean? Turning to the dictionary we have numerous options, but typically we are presented with such offerings as: "able to be maintained at a certain rate or level" and "conserving a balance by avoiding depletion of natural resources". Arguably, these terms are more than a little vague and imprecise.

Of course, in everyday use, the term sustainable is most frequently associated with the environment, but even then the thinking does not go deep enough and is all a bit murky. Surely, to be sustainable it should mean that whatever is being offered as a "sustainable" solution must be assessed at each and every stage and every level. The product itself may not harm the environment or deplete natural resources, but what about the energy used in its manufacture or processing, the materials used for its storage and packaging, the fuel used to transport it across the world, and the impact of its disposal at the end of its working life? These are all issues that impact on the credibility of sustainability claims – or at least, they should!

Even that is not the end of the sustainability story. To be truly sustainable, design, raw material acquisition and usage, engineering, reliability and longevity all must come into play, as does the financial resilience and trading commitment of the company providing the product. For example, a fire safety solution proudly heralded as a "sustainable solution" is, in practice, no such thing if, for example, replacement parts are not readily available years down the line (not to mention being available without the necessity to fly them across the globe) or worse, if the company manufacturing the product goes out of business or ceases manufacturing of that particular line.

So the sustainability of businesses is equally important and companies rightly need to ensure

that their competitiveness and profitability is such that they will be supporting the original performance of their "sustainable" product way, way down the line. In short, this means that the business, and not just the product, needs to be sustainable. Achieving this should mean that products last longer, which could well impact negatively on future sales, so the ability and willingness of businesses to invest in research and development in ever more improved solutions is another consideration in the sustainability equation.

Sustainability is not so much a result as it is a never ending journey. There will always be scope for improvement from one end of the supply chain to the other. In addition to ensuring that their own house is in order, manufacturers need to be equally demanding with their component suppliers, their sub-contractors and trading partners. They should also have thought through the implications of disposal at the end of the product's life.

At the other end of the chain, end users must accept that regular inspection, servicing and maintenance are essential investments in sustainability rather than a cost to grudgingly be endured and minimised or even avoided. End users need to be much more searching when selecting which supplier and solution to use. It is not enough to simply accept the word "sustainable" as some sort of badge of acceptability, otherwise it will remain a word with very limited meaning. **IFP**

The more eagle-eyed readers may have noticed a subtle change with this edition of *International Fire Protection*. We have moved the cover date forward by a month to more accurately reflect when the magazine is current. So, in future, IFP will be flagged as March, June, September and December, but the editorial copy and advertising deadlines remain unchanged.



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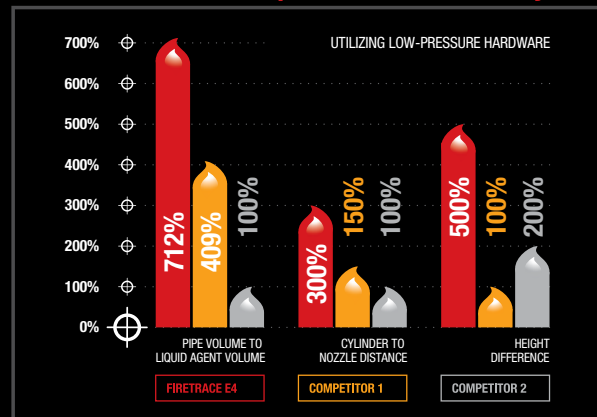
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Firetrace International –  
World Headquarters  
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Firetrace International  
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Firetrace International Ltd LLC  
Middle East Office  
PO Box 442042, Dubai, UAE  
+971 56 7599490



**Kathleen Almand**

NFPA

It is an honour to have the opportunity to reach so many fire and life safety professionals from around the world through a renowned publication like *International Fire Protection*. NFPA is fortunate to have media partners like MDM Publishing, which is committed to making a meaningful contribution to the safety infrastructure of countries around the world. To you, the readers, greetings from NFPA. We welcome and celebrate the New Year with this opportunity, a wonderful gift from you and our friends at MDM Publishing. NFPA is committed to writing a quarterly column that includes timely, critical topics related to codes and standards, news and events that can help support you in your profession.

Olga Caledonia, NFPA  
Executive Director of Global Operations

**Kathleen Almand** is  
Executive Director, Fire  
Protection Research  
Foundation

For further information, go to  
[www.nfpa.org](http://www.nfpa.org)

# Global High-Challenge-Warehouse Protection Needs

As the marketplace for industrial products and systems becomes increasingly global, corporations are seeking strategic solutions for storage and retrieval of these commodities. Innovative automated systems are enabling unique warehouse configurations – storage heights above fifty metres are not uncommon. Sophisticated storage and distribution centres are located strategically close to markets; and indeed in many cases serve as retail outlets. All of these innovations increase efficiency of storage; they also present unique fire protection challenges for the property protection community.

The nature of commodities stored in warehouses is also changing; increased use of plastics for packaging and pallets, and emerging types of commodities such as lithium ion batteries, aerosols, and others, are also changing the landscape of commodity storage. These developments, together with the changes in warehouse configuration described above, are causing some fundamental reconsideration of the basis for storage protection currently prescribed in global codes and standards such as the *Standard for the Installation of Sprinkler Systems*, NFPA 13.

The Fire Protection Research Foundation, NFPA's research affiliate, has a long history of research in support of NFPA 13. The Foundation's completed research portfolio includes sprinkler solutions for solid shelf storage, compact mobile shelving, exposed expanded plastics, lithium ion batteries, and many others. Configuration challenges, such as the presence of high-volume, low-speed fans have also been addressed. In 2009, the Property Insurance Research Group, a group of industrial property insurers with an interest in improving the technical basis behind standards for property protection, was formed under the Foundation's umbrella. This group meets regularly to share field experiences, note emerging challenges, and define and implement a research agenda to address those challenges. Its current protection research interests include lithium ion battery storage, impact of obstructions on sprinkler protection, and storage under sloping ceilings. The group is worldwide mirroring the global nature of the insurance industry and the companies they insure.

In recognition of this global landscape, and to assist in technology transfer, in June of 2012, the Foundation sponsored a research update in Paris on strategies to meet the new challenges presented by emerging storage configurations and commodities worldwide. The conference, the proceedings of which can be found in [www.nfpa.org/foundation](http://www.nfpa.org/foundation), brought together leading global companies that are facing these challenges and the research community to explore developing solutions. The Foundation's Property Insurance Research Group sponsored the event as a means to share emerging global information.

Due to the success of the event, the Foundation will sponsor a second update on May 22nd, 2014. The event will be held in collaboration with Fire Sprinkler International 2014 ([www.firesprinklerinternational.com](http://www.firesprinklerinternational.com)), the only conference in Europe dedicated to sprinkler and water mist technology, at the Grange Tower Bridge Hotel in London, England. Registration is currently open at [www.nfpa.org/foundation](http://www.nfpa.org/foundation) and a special discounted rate is available for participants attending both events.

The programme will feature a keynote presentation from global property owner, Procter and Gamble Corporation, USA and European research updates on storage hazards and solutions, and an insurance industry "look ahead" at tomorrow's storage challenges. Attendees will benefit from solutions to real-world applications such as lithium ion battery storage, high hazard plastic storage, and unique shuttle storage configurations. We hope to see some of you in London to discuss your concerns and share possible solutions!

IFP

# SFPE Appoints New President

Carl F. Baldassarra has taken over the presidency of the SOCIETY OF FIRE PROTECTION ENGINEERS (SFPE) for 2014, capping a distinguished record of service to the Society at the local, regional and national levels.

Mr Baldassarra is an Executive Vice President of The RJA Group, the parent company of Rolf Jensen & Associates (RJA) and RJA International, based in the RJA Chicago office. He is a licensed Professional Engineer (PE) in three states, and started his career in 1971 as a fire protection system designer with Schirmer Engineering Corporation, retiring in 2009 as President.

Mr Baldassarra joined RJA, where he heads up the western region operations as well as serving as RJA's liaison to numerous professional organisations including the International Code Council (ICC), the Council on Tall Buildings and Urban Habitat (CTBUH), the Chicago Committee on High-Rise Buildings, the National Institute of Building Sciences (NIBS), the National Fire Protection Association, the Fire Council of Underwriters Laboratories and the NFPA Research Foundation.

For more information, go to [www.rjainc.com](http://www.rjainc.com)

# Advanced Electronics' Global Re-branding

Advanced Electronics has launched a global brand that unifies its international operations and reflects, the company says: "... the market-leading values and product advantages that have quietly made it a global success story." Now known simply as 'Advanced', all of its international operations are now aligned under the new brand. The rebrand is described as being not simply a change in corporate identity, but a refocusing on the business' strengths that also includes new product and service brands.

Advanced delivers products in more than 60 countries worldwide, and its systems hold global approvals and are tailored to individual markets. Its Axis fire system is approved to EN54, UL 864, ISO7240, AS1670, AS7240 as well as numerous territory specific approvals and certifications.

The company's UK focused panel-only, multiprotocol solution is now sold under the MxPro banner and this is joined by the LifeLine fire paging and ExGo extinguishing and suppression control systems. The rebrand will also see the launch a number of new products and services including AdSpecials, its custom design and build service, which manufactures unique interfaces, mimics and controls to customer specifications. Advanced's customer and technical support service will now be known as Advanced360. The company has offices and operations across the UK, USA, Australia, the Middle East and India and a worldwide distributor base.

For more information, go to [www.advancedco.com](http://www.advancedco.com)

# New President & CEO at Firetrace International

Mark D. Cavanaugh has been promoted from Sr. Vice President and CFO at Scottsdale, Arizona-based FIRETRACE INTERNATIONAL to President and CEO. Outgoing president, William Eckholm, has decided to "take a step back and focus on other priorities in life" but will remain with the company as Vice Chairman.

Mr Cavanaugh joined Firetrace in 2005. In his prior role he was responsible for leading the Firetrace aerospace and defense group and the operations in Europe, the Middle East, Africa and India, along with his role overseeing the finances and legislative affairs of the company.

In the 15 years that William Eckholm led Firetrace it grew from a small 112 square metre facility to what is now the company's fourth global headquarters, with over 5575 square metres of manufacturing and office space. Firetrace also operates an additional manufacturing facility in the UK along with sales offices in six other countries around the world.

For more information, go to [www.firetrace.com](http://www.firetrace.com)

# E2S Warning Signals catalogue

E2S, which specialises in the design and manufacture of high performance audible and visual signals and control devices for hazardous areas, industrial environments and wide area disaster warning applications, has published a new 384-page catalogue. Each product page offers detailed specifications including hazardous area classifications, performance data, third-party approvals, dimensional diagrams and part code configuration.

All the latest products launched this year are included. To assist with product selection, the catalogue contains technical articles regarding the selection of both audible and visual signals with examples of effective distance calculations and offers advice regarding additional design considerations. The new catalogue is available for immediate download from the company's website.

For more information, go to [www.e2s.com](http://www.e2s.com)

# New President at Fike

FIKE CORPORATION has named Brad Batz as President.

In this role, Mr Batz will lead all corporate functions, which include manufacturing, quality, supply chain, finance, human resources and information technology. Prior to this position, he led Fike's oil and gas business unit where his responsibilities included new product development, sales, and customer service and support. He also previously led Fike's Corporate Operations, where he was responsible for manufacturing, supply chain, quality and continuous improvement activities around the world.

For more information, go to [www.fike.com](http://www.fike.com)



# Introducing EN12845 FIRE PUMP LINE

Patterson Pump Ireland Ltd. specialises in the production of world class fire protection equipment around Europe.

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EN12845 provides a pan-European standard for the design, installation and maintenance of automatic sprinkler systems, and encompasses the basic requirements set forth by local rules into one European Standard.

The new Patterson Pump End Suction product line is the latest addition to the Patterson Sentinel™ range. Cost effective and efficient, these will be used in fire pump packages specifically designed and built to comply with the regulations of European standard EN12845, along with other local rules.



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# New Total Room Flooding System Unveiled

FIRETRACE INTERNATIONAL has unveiled what it describes as its "next generation" evolutionary E<sup>4</sup> system that optimises the "industry standard" flow calculation method in order to exploit the superior flow characteristics of 3M Novec 1230 Fire Protection Fluid. It is claimed to deliver substantial and measurable performance enhancements when compared with traditional delivery systems.

E<sup>4</sup> uses 35bar high pressure efficiency, utilising lower-cost, low pressure hardware optimised for Novec 1230, while achieving the performance of more costly high-pressure or "nitrogen driver" systems. The system complies fully with every aspect of NFPA 2001: 2012 (Standard on Clean Agent Fire Extinguishing Systems) and the European standard BS EN 15004:2008 (Fixed firefighting systems. Gas extinguishing systems. Design, installation and maintenance).

The new system incorporates a number of innovative engineering developments and Firetrace International says it offers system installers greater flexibility, speedier



installation, significantly lower overall installed cost and a measurable competitive edge. End-users benefit from a much lower financial outlay when compared with other systems on the market, and greatly improved design freedom. By merely replacing the cylinders and nozzles, E<sup>4</sup> provides a swift, least-cost transition from most existing Halon systems to Novec 1230 clean agent technology. Firetrace International

has assessed that more than 75 percent of the existing Halon distribution networks around the world can be easily and cost-effectively refitted with its E<sup>4</sup> utilising the existing piping.

The system is said to drastically slash the amount of piping used, and the number of tees and nozzles, with savings on distribution network alone being typically between 25 percent and 40 percent. The challenge of having to accurately equally balance the amount of agent at Bull T and Side T connections has also been overcome, plus extra pipe lengths between tees is either

minimal or completely unnecessary. The result is an installation that can show more than a 50 percent saving on labour costs through "smart" pipe layouts that are impossible to achieve with the design limitations of industry-standard systems.

**For more information, go to [www.firetrace.com](http://www.firetrace.com)**

## Hotel Group Invests in Fire Protection

REFLEX SYSTEMS has completed a major project to upgrade the fire detection systems for one of the UK's leading hotel groups, QMH UK Ltd.

The contract was carried out over a four week period, which involved upgrading the fire detection systems in 18 hotels, including 12 Holiday Inns, three Best Western hotels and three Crowne Plazas, stretching from Plymouth to Glasgow. Careful project planning and co-ordination ensured that the impact of system downtime of the hotels' systems was kept to a minimum. Analogue addressable fire detection systems were installed across the hotel group's accommodation, leisure and conference facilities.



**For more information, go to [www.reflexsystems.co.uk](http://www.reflexsystems.co.uk)**

## Fire Sprinkler International 2014

BAFSA (British Automatic Fire Sprinkler Association) and EFSN (European Fire Sprinkler Network) are co-sponsoring Fire Sprinkler International 2014 in partnership with the Fire Protection Research Foundation – an affiliate of the National Fire Protection Association – to present three days of presentations covering all aspects of water-based automatic fire suppression. It is being promoted as the only conference and exhibition outside North America dedicated to sprinklers and water mist.

The event will take place in London at the Grange Tower Bridge Hotel on 20th and 21st May, followed by the Fire Protection Research Foundation Seminar on 22nd May on emerging storage hazards and potential storage configuration challenges. More than 300 delegates are expected to attend.

**For more information, go to [www.firesprinklerinternational.com](http://www.firesprinklerinternational.com)**



# Managing Safety at Swiss Super-computer

SIEMENS has supplied the new Swiss National Supercomputing Centre with what the company describes as: "state-of-the-art technology capable of managing and controlling its building automation, safety and security systems." The Centre houses the fastest computers in the country and facilitates world-class scientific research by pioneering, operating and supporting leading-edge super-computing technologies.



Siemens' integrated solution covers the Centre's infrastructure needs, ensuring the highest levels of building performance and energy efficiency, as well as its entire safety and security requirements. The solution manages and controls all the different facility sub-systems, while metering and monitoring the Centre's power consumption.

The solution comprises IP cameras, along with a Sinteso fire detection system, integrated via BACnet (Building Automation and Control Networks), the communications protocol for building automation networks. The fire detection system includes 430 detectors, 28 manual call points and 228 alarm indicators. The integrated voice notification system, supporting the full-scale evacuation of the building if needed, consists of four power-speakers, 250 loudspeakers and 62 strobe lights. To provide simple and intuitive control of all the building systems, a Desigo Insight management station with over 4000 data points and 21 controllers is installed.

A decisive factor in choosing Siemens was the advantage of obtaining a complete solution from a single supplier. Siemens handled every aspect of the project, from design through project management and installation to on-going maintenance of the system afterwards.

For more information, go to [www.siemens.com/datacenter](http://www.siemens.com/datacenter)

# Safeguarding Museum's Star Attraction

A C-TEC XFP addressable fire panel system is now protecting the star attraction – a magnificent 100 year-old mill steam engine – at Wigan's new Trencherfield Mill steam engine museum in Lancashire in the UK.

A network of three 32-zone XFPs safeguards not only the irreplaceable antique machinery in the museum but also The Academy of Live and Recorded Arts Theatre, which hosts live theatre, training workshops, acoustic music nights and children's theatre.

For more information, go to [www.c-tec.co.uk](http://www.c-tec.co.uk)

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# Repeater Panel Launch

FIKE SAFETY TECHNOLOGY (FST) has launched a repeater panel as part of its TWINFLEXpro smart two-wire fire detection system. The repeater panel is a small remote display unit that can be connected to a four or eight zone version 2 TWINFLEXpro panel via an RS485 data link, with a maximum of eight repeater panels connected to a single control panel.

The unit does not itself connect to or control any devices; it simply reports all fire and fault events that occur in the system. It can also perform system actions over the data link, such as: silence alarms, reset, sound alarms and silence buzzer. The repeater panel is intended to provide display capability at secondary building entrances, nurses' stations and at any location where the panel event information is required to be displayed.

The system incorporates the multipoint combined smoke and heat detector with



built-in sounder, which allows the whole system to be easily installed using only one pair of wires for each zone. As multipoint offers seven different modes of detection,

the installation is made simpler since one device suits all applications. Checkpoint alarm confirmation technology is a feature of the system that has seen TWINFLEXpro installed extensively in applications such as houses of multiple occupancy (HMO). This is a configurable pre-alarm that can be set on detectors in dwelling areas that allows time to investigate the cause of the alarm before building-wide evacuation is initiated. This system has the ability to differentiate between call point and detector alarms; can accommodate a maximum of 32 devices for each zone; has separate fault monitoring display for each zone; incorporates a man-walk-test facility and zones can be configured without the need to use resistors or capacitors.

For more information, go to [www.fikesafetytech.co.uk](http://www.fikesafetytech.co.uk)

## Dryer & Plenum Systems Insulation

UNIFRAX has announced the North American launch of FyreWrap DPS insulation for dryer and plenum systems – a high temperature insulation blanket specifically designed, tested and UL certified to provide a single layer, one hour rated flexible enclosure around dryer exhaust ductwork and residential kitchen exhaust ductwork. It provides code compliant fire protection for combustible items such as plastic pipes by preventing flame propagation and smoke development in the plenum area.



FyreWrap DPS insulation is claimed to be a thinner, lighter wrap product than has previously been available in the market, providing significant space savings when compared with traditional gypsum shaft enclosures. It offers contractors an easy to install and effective solution for applications with limited space where dryer ductwork is routed through rated wood truss/joint construction.

Features of the new single layer, thin, lightweight, and flexible high temperature insulation blanket include UL testing and certification that reflects construction site conditions, code compliance, ease of installation, and encapsulated insulation that provides protection from moisture absorption and tearing.

For more information, go to [www.unifrax.com](http://www.unifrax.com)

## Online Training



NEXT KNOWLEDGE, a division of Hughes Associates, has announced that its self-paced fire and electrical safety training is now available to the fire protection industry through a new online learning centre. It comprises over 100 hours of training devoted exclusively to fire protection and electrical safety topics.

The training is delivered in a straight-forward, interactive format. The courses are written by noted experts in fire protection codes and standards, who also have extensive hands-on experience. The result is high-impact courses designed for professional engineers and technicians who require training on demand, delivered in a straightforward but engaging presentation.

For more information, go to [www.nextknowledge.com](http://www.nextknowledge.com)

# Hospital Fire Alarm Upgrade

Voice sounder specialist, VIMPEX, has supplied a major upgrade to the fire alarm system at London's Moorfields Eye Hospital. In the first phase of the project, Moorfields has replaced fire alarm bells with 250 multi-message Fire-Cryer Plus voice sounders. When the project is complete, the hospital will have over 500 fitted.

Since staff and occupants are familiar with the traditional bell tone, the voice sounders have been programed so that a realistic bell tone precedes the evacuation and alarm messages. The system has been configured into 48 zones to allow phased evacuation of the building in the event of a fire. This also reduces the disruption to patients and staff in the event of a false alarm or an incident that can quickly be resolved. The use of unambiguous voice messages to accompany the traditional bell tone will aid safe evacuation by removing the confusion often associated with building alarms.

Each voice sounder can be programmed with up to seven messages from a library of thousands, many of which are multi-lingual, ensuring that any site requirement can be fulfilled. The units can be fully synchronised and have a low current consumption allowing simple replacement of existing sounders and bells. The Fire-Cryer's multi-message capability also ensures that system test and all clear messages can be easily transmitted avoiding confusion with the fire/evacuation alarm.

All of the voice sounders at Moorfields are the standard wall-mounted units, some of which have been specified with the integral synchronised high-output LED strobe, ensuring alarms can be seen, heard and understood. Other models in the range include ceiling mounted units that can be installed under smoke detectors and high-output versions for use in wide open spaces and outdoors.

For more information, go to [www.vimpex.co.uk](http://www.vimpex.co.uk)



## Passive Tunnel Protection

MORGAN ADVANCED MATERIALS has launched a high-performance sprayed refractory cement product for fire protection that is said to offer superior fire protection and simple, cost-effective installation. FireMaster FireBarrier 135 is ideal for concrete tunnel lining fire protection and the fire protection of ventilation shafts, escape tunnels and refuges, as well as critical systems such as water mains and communication cables.

FireMaster FireBarrier 135 has been specially developed to cope with the high temperatures that may occur in tunnel fires; it can withstand repeated and prolonged exposure to high temperatures. It can be installed onto concrete or metal substrates using standard spray equipment with very low spraying wastage during installation, while its single-layer application makes it rapid and easy to install. It adheres to most construction materials and can be installed quickly, helping to reduce labour costs while maintaining the final product's quality and proven reliability.

The material has extremely high adhesion strength – typically eight times its weight, allowing fixings to be attached directly to it. It can be trowelled flat to provide a high-quality surface finish that can be used as the final tunnel lining surface (with optional painting), avoiding the need for secondary cladding. It can also be cast into sheet form and installed as a dry board or shape for applications where spraying is not convenient. Capable of resisting the environmental conditions found in tunnels, the material is also resistant to water jet sprays used to clean tunnel lining, and will not spall when subjected to water hose sprays at high temperature, increasing firefighting safety.

For more information, go to [www.morganthermalceramics.com/firemaster/](http://www.morganthermalceramics.com/firemaster/)

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# The Importance of Reducing False Fire Alarms

Every false fire alarm is costly, disruptive and detrimental to safety. Each year businesses and public services in the UK have nearly a quarter of a million false alarms costing, according to the Fire Industry Association, them and the fire and rescue services approximately £1 billion. Every false fire alarm causes major disruption to customer service, productivity or the general routine of any organisation.

**B**eyond disruption, false fire alarms have a significant impact on the effectiveness of a fire evacuation strategy and may put the lives of staff, students and visitors at risk. If a genuine fire alarm is mistaken for yet another false alarm and, therefore, ignored, the physical consequences for the people involved can range from respiratory difficulties, injury from burns or even death.

Quick and appropriate reactions to a fire alarm may prevent a real fire from causing significant damage and disruption. Companies that suffer a serious fire may never effectively recover and could stop trading.

## Measures Imposed to Reduce False Fire Alarms

It has been announced that the London Fire Brigade will be the first fire and rescue service in the country to charge organisations for calling out its firefighters to false fire alarms. From the 1st January 2014, the likes of hospitals, airports and student accommodation will be paying for callouts to false fire alarms. The £290-plus-VAT penalty, which will not hit domestic properties or care homes, will apply to buildings across London. Many fire and rescue



services across the United Kingdom are starting to take a similar approach with varying costly penalties.

## Who is Responsible for False Fire Alarms?

Under the Regulatory Reform (Fire Safety) Order Act 2005, it is the responsibility of the building owner or the 'responsible person' to ensure effective fire precautions are in place to protect staff, students or visitors. Several precautionary steps can be implemented to prevent false fire alarms before they occur. Routine testing and maintenance of call points is a must to assure proper operation, but it is not the only proactive approach. The solution is to protect fire alarm call points against accidental or malicious activation.

Clear, tough polycarbonate covers easily retrofit over existing call points, providing protection within minutes, where accidental activation is of concern. If malicious activation is likely to be a problem, covers with an optional, localised, alarm can be installed over a call point. The local alarm sounds when the cover opens and draws immediate attention to the area, but will not hinder legitimate use in the event of an emergency. In the case of an attempted malicious activation, the perpetrator will most likely be taken by surprise and run away, or be apprehended before the main fire alarm sounds.

Accidental false fire alarms (for example, a call point hit by a ball in a sports hall or heavy equipment within a warehouse) can easily be prevented by installing call point covers. Covers can also provide a level of weather protection from IP24 to IP56, ideal for use in extreme conditions, indoor or outdoor, such as wash down areas and saline atmospheres. **IFP**



For more information, go to [www.sti-europe.com](http://www.sti-europe.com)



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# Converged Safety & Security Solutions

XTRALIS has announced its “next-generation Xtralis Everywhere (Xtralis-E) portfolio” of what it describes as its converged safety and security solutions, a portfolio that provides early, reliable detection and remote visual verification of smoke, gas, and perimeter threats for businesses, governments, and critical infrastructure.

Among the next-generation solutions released were VESDA-E and VESDA Laser Quantum (VLQ) aspirating smoke detectors (ASD), and the ADPRO FastTrace 2E remotely managed multi-service gateway (RMG) security platform. The new safety and security platforms can be enhanced with seamless hardware expansion modules and innovative, remotely downloadable software analytics, called Xapps. Using Xtralis Xchange, an online licensing portal with a downloadable PC application, Xapps can be quickly deployed to remotely manage, configure, and exchange licenses to Xtralis platforms.

In addition, Xtralis has revealed its comprehensive safety and security convergence strategy using these platforms to achieve 100 percent detection with zero percent false alarm rates, a goal previously thought to be unattainable.

VESDA-E is the next-generation of VESDA ASD system. It surpasses VESDA with 15 times greater sensitivity to smoke and double the longevity while maintaining sensitivity over its lifetime, all with four percent less power consumption. Xtralis will continue to offer VESDA for a wide variety of applications, while initially targeting VESDA-E at the retail, healthcare, education, and office building segments. VESDA-E also delivers a first in aspirating smoke detection – pin-point ASD addressability at up to 120 holes. This brings the early, reliable detection of VESDA to main stream applications with a lower total cost of ownership advantage.

The ADPRO FastTrace 2E is a 4-to-20-channel next-generation version of the FastTrace 2, a remotely managed multi-service gateway platform for video recording, bi-directional audio for deterrence, transmission over any network, and remotely downloadable software analytics to eliminate threats to a facility through automatic visual



Picture Courtesy of Xtralis

detection and verification. The FastTrace 2E provides superior detection capabilities and is up to 86 percent

lower in total cost of ownership than solutions combining discrete recording, transmission (for remote access over any network), and analytics capabilities.

The VESDA Laser Quantum brings very early warning to compact areas where it was previously unaffordable. VLQ offers four Class-A VEW holes and quick and easy installation and commissioning, covering 100 square metres. Target applications include remote telecom exchanges, base stations, portable data centres, and other compact critical infrastructure applications.

For more information, go to [www.xtralis.com/xtralis-e](http://www.xtralis.com/xtralis-e)

## New Intrinsically-safe Sounders



E2S has launched high-performance, intrinsically safe alarm horn sounders and combination devices with aluminium enclosures. The IS-D105 sounder and IS-DL105 combination device are approved to IECEx and ATEX standards for Zone 0 and the IP66 sealed marine-grade aluminium enclosure is phosphated and powder coated, offering enhanced protection for onshore and offshore applications.

The alarm horn produces up to 105 dB(A) at one-metre with a choice of 49 alarm tones and two additional, remotely selectable, alarm stages. For specific applications, custom tone configurations and frequencies can be engineered. The sounder can be combined with an LED beacon featuring an array of six high-intensity LEDs.

The alarm sounder and LED beacon can be powered through a single Zener barrier or galvanic isolator. Alternatively, the audible and visual elements of the IS-DL105 combination model can be controlled individually. When cabled with a common power supply, the sounder features an alarm accept function. By closing a pair of external contacts such as a push switch, the operator may silence the alarm for set periods between five seconds and two hours. The LED beacon continues to flash at twice its normal frequency providing indication of an ongoing alarm condition. If after the pre-set time the alarm condition still exists the alarm horn will activate again.



For more information, go to [www.e2s.com](http://www.e2s.com)

# Improved Performance Sensors

HOCHIKI EUROPE has announced the launch of three new sensors. The new AaLN-EN, ATJ-EN and ACC-EN devices are claimed to have a number of innovative features that improve functionality and reduce false and unwanted alarms.

Replacing the ALG-EN photoelectric smoke sensor, the ALN-EN refines the responsiveness of the company's High Performance Chamber Technology. Its design minimises the differences in sensitivity experienced in flaming and smouldering fires, providing an optical chamber that is equally reactive to all smoke types and greatly reduces the possibility of false alarms.

The ACB-E heat sensor has been superseded by the ATJ-EN, which incorporates a variable temperature heat element as well as a rate of rise heat element – both of which can be managed from a control panel. This allows either or both elements simultaneously to play an active part in making the alarm decision.

The ACC-EN has taken over from the ACA-E as the company's flagship multi-sensor. It features three modes, allowing the optical element, the thermal element or both elements to be active. Like the ALN-EN it also has the advantage of utilising High Performance Chamber Technology.

All three devices are fully compatible with Hochiki Europe's Enhanced Systems Protocol (ESP). They boast increased noise immunity and a number of software advances. To help with identification, newly designed ergonomic outer covers come with 'at-a-glance' marking – unmarked denotes smoke, one ring heat, and two rings indicates it is a multi-sensor. Each device is fully backwards compatible with its predecessor, the chambers can easily be removed or replaced for easy maintenance, and the sensors are EN54 and LPCB third-party approved, alongside VdS and SIL verifications.

For more information, go to [www.hochikieurope.com](http://www.hochikieurope.com)



## New Conventional & Twin-Wire System

ADVANCED, has launched a new conventional and twin-wire fire system called QuickZone, described as being quick to install, configure and maintain. The system can cover from two to 12 zones and is EN54-2&4 approved. It comes in two panel formats; the standard and stand-alone QuickZone and the QuickZone XL, which also features a passive or fully functional repeater.

Both are compatible with a wide range of conventional devices and offer a host of flexible zone, input and output programming options. Both also offer test and false alarm management modes. Interfaces are simple, buttons are colour-coded with management and programming accessible via code entry or key-switch. QuickZone's enclosures are designed to make installation and wiring simple.

QuickZone is available in all of Advanced's EN54 territories including the UK, Europe, Africa, the Middle East and Asia.

For more information, go to [www.advancedco.com](http://www.advancedco.com)



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# FireDos – The Name for Proportioners & Monitors

FireDos is a dynamic, medium-sized German company that has been operating successfully for more than 25 years in the highly specialised field of dosing technology that does not require any external power supply. For the past decade and a half, the company has established an international reputation for its products under the FireDos name. More recently though, it has expanded its offering and today also designs and manufactures a wide range of high-quality firefighting monitors.



Thanks to their many advantages, FireDos proportioners quickly gained an enviable reputation and today there are several thousand installed around the world, ready around the clock to safeguard high-risk environments at a moment's notice.

Much of this reputation is founded in the fact that FireDos is responsible for every aspect of its products. Every stage is handled in-house, from design and development, registration and production – including the manufacture of most components – through to sales and customer support service, quality assurance and environment management; all remain under FireDos control.

### World Renowned Proportioners

FireDos proportioners are suitable for the proportioning of fluids and work reliably and at a constant proportioning rate without the need for any external energy, even under changing pressure conditions.

The drive is provided entirely by the extinguishing water flow. The water flows through the water motor, which is installed directly in the extinguishing water line. The extinguishing water flow is therefore available entirely for firefighting, without any loss. The number of rotations of the water motor is proportional to the volume flow rate of the extinguishing water.

The water motor and proportioning pump are connected with each other via a coupling, and therefore operate at the same speed. A purely mechanical system, which regulates itself



automatically; the more extinguishing water that flows through the water motor, the more extinguishing agent is added, and vice versa. The proportioning rate is selected by the user and always remains constant.

### New Firefighting Monitors

Last year, FireDos took a major step in the company's development and after extensive research and development added a new generation of firefighting monitors to its product range. Not that monitor technology was new to the company, as key personnel in the company have accumulated more than 100 years' experience in monitor design, development, manufacture, distribution and service. As FireDos customers expect, the new monitors share the same pedigree as the company's proportioners; they are robustly engineered, with high-end technical performance characteristics.

The new range will ultimately comprise the M2 (up to 2,500 litres/minute), the M3 (up to 4,000 litres/minute), the M4 (up to 6,000 litres/minute), the M5 (up to 10,000 litres/minute), the M7 (up to 20,000 litres/minute), and the M12 (up to 50,000 litres/minute). The first of these to be introduced was the M4 with a volumetric flow rate of water of up to 6,000 litres/minute. All FireDos monitors feature the ground-breaking "oval flat design" and are suitable for water, foam or powder output, can be supplied in aluminium or bronze alloys, with manual or electrical actuation (direct or alternating current).

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For more information, go to  
[www.firedos.de](http://www.firedos.de)

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# FOGTEC – Renowned for Water Mist Suppression

FOGTEC was established in Cologne, Germany in 1997 and today has offices in Germany, France, Austria, Brazil, India, China and Saudi Arabia, plus more than 60 licensed partners in Europe, the Middle East, Africa and Asia. The company specialises in the development, manufacturing and marketing of stationary and mobile fire detection and firefighting equipment, focusing particularly – but not exclusively – on the fire protection of rail systems, tunnel systems, industrial facilities and buildings, ships and oil platforms.

**W**ith more than 60 system partners worldwide, FOGTEC is a market leader for land-based water mist systems. The company's primary aim is to continuously improve the protection of people and property with its water mist systems. By its 24/7 service-disposition the company is available to its customers around the clock.

## World Class Technology

The company's systems use pure water, converting it to fine water mist at a pressure of 80 bar to 200 bar.

In a fire, mist droplets rapidly evaporate, and their volume increases by a factor of 1650. This displaces the oxygen locally at the fire's source and suffocates the fire. The strong cooling effect serves not only to fight the fire but also protects people and property against the effects of radiated heat. These water mist systems are not only 100 percent environmentally friendly; they are often more effective than conventional gaseous or water firefighting technologies.

FOGTEC water mist systems present state-of-art technology with proven efficiency in a number of full-scale fire tests. Special water mist nozzles are the heart of every FOGTEC system. They are optimised for specific applications and have undergone extensive testing with independent testing houses such as Factory Mutual, to ensure their reliability. Every FOGTEC water mist nozzle is subjected to a 100 percent quality test.

## Excellent References Worldwide

FOGTEC comprises three separate business units: fixed systems, tunnel systems and rail systems.

The fixed systems unit specialises in water mist systems for a number of different fixed and mobile



applications and offers fire protection solutions for environments and fire safety challenges that include archives and libraries, clean rooms and flammable liquid stores, power plants and cable tunnels to name but a few. The Mecca Clock Tower, Tianjin Museum in China and the Bharati Research Station (Antarctic) rank among its excellent references.

The tunnel department concentrates on the protection of underground facilities such as tunnels and metro stations. Specially trained engineers provide consultancy services as well as turnkey solutions. Cooperation with researchers and tunnel owners, as well as manufacturers of complementary products, has led to the development of products specifically suited for tunnel applications. FOGTEC has successfully protected a number of tunnels with full-scale tested technology such as the Eurotunnel, Virgolo tunnel (Italy) and the Dartford Crossing (UK).

FOGTEC rail systems, another business unit of the company, has specialised in developing and selling user-specific fire protection solutions in the rail transportation sector. Its fire detection products ranges from the simple smoke switch to complex fire detection systems, including data transmission by SMS to any cell phone or to the control unit. In the firefighting sector, the portfolio ranges from autonomous object protection systems to complex modules for integration into vehicles. FOGTEC rail systems are, for example, protecting the metropolitan trains of Sydney and Sao Paulo and have equipped trains of the Finnish operator Junakalusto Oy.

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For more information, go to  
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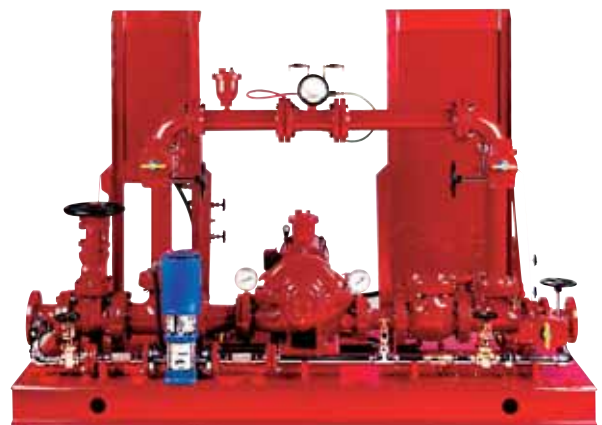
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**Wilf Butcher**

Association for  
Specialist Fire Protection

# Is Fire Down to a Simple Triangle?

There are many elements to consider when attempting to prevent and control fire within the built environment.

**T**he triangle of fire is a well-recognised and understood model for determining the constituent parts necessary to create and sustain a fire. If any one of the three key elements – oxygen, heat or fuel – is missing then a fire simply cannot take hold. If any of the three elements is removed during an established fire, for instance by cutting off the air supply, the fire will go out.

To a greater or lesser degree all buildings will contain sufficient quantities of all three of the above ingredients to enable a fire, with its associated hot smoke and gases to occur. The extent to which any such fire will develop and spread will be governed by a second triangle, which I call the 'triangle of construction'. This triangle is also made up of three essential elements, those of design, construction and maintenance.

Provided that those responsible for each one of these essential elements ensures that the fire provision within their remit of responsibility is undertaken in an appropriate manner, then it is

reasonable to assume that the development and spread of a fire will be held to a minimum. However, if for any reason one of these processes should prove inadequate, it is probable that the growth and spread of fire and its associated components will be significant, irrespective of whether the other elements of the triangle are seen to be 'fit for purpose'.

Such a 'triangle of construction' is of course the polar opposite of the 'triangle of fire', in that; failure within any one element will actually lead to a fire spreading rather than result in it being extinguished. In reality of course, fires will always happen either by unfortunate circumstance or as a deliberate act. Therefore the issue to be addressed is, how can such fires be controlled once ignited to minimise risk to life and property?

Each group defined within this 'triangle of construction' has a duty to ensure that, in the unfortunate event of a fire, they have taken the necessary steps to ensure that their responsibilities

Pic courtesy of ASFP member BM TRADA



in relation to fire safety have been fully met. What does this mean in practice?

### Building Design – the First Side of the Triangle

It could be argued that fire protection, be it passive or active, could be construed as a grudge purchase, adding nothing to the aesthetics of a building and often perceived to be very expensive!

Regulations lay down a basic set of parameters in relation to life safety in the event of a fire and are not intended to offer protection to the building. Yet, even these basic mandated levels of protection are often seen as a challenge to value engineer down to a minimum or, in some cases, engineer out altogether.

The design process can also lead to weaknesses in the completed construction. A tendency toward design and build means that the design of fire compartments, for example, and the services passing through them are often inadequate. As a result, divisions are poorly thought out and the fire-stopping contractor often has to sort out an inherited mess, with common issues including: mixed services passing through the same wall; fire dampers that are not in the plane of the wall/floor; and the use of inappropriate products and materials. In addition, he frequently has to work in an environment with insufficient access, which makes doing his job very difficult.

Proper design of divisions and planning/sequencing of the work is critical to ensure the compartmentation is adequately provided. The Association for Specialist Fire Protection (ASFP) has recently published its Technical Guidance Document 17: *Code of practice for the installation and inspection of fire-stopping*. This publication stresses the importance of adequate design and planning and can be downloaded from <http://is.gd/FCjaV1>.

When it comes to appropriate building design, granted, the award-winning façade is important and its green credentials essential, but not by trading off investment in vital fire safety provision. Removing or downgrading essential fire protection

measures from the design, may result in all other attributes having no relevance at all should the building be razed to the ground by fire. It is critical that any building design adequately reflects its fire protection needs, and this means an effective fire compartmentation strategy.

### Building Construction – the Second Side of the Triangle

Within the UK and many other parts of the world there is no mandatory requirement calling for fire protection measures to be installed or undertaken by a competent person or via a third-party certificated process.

Lack of appropriate knowledge both by those that procure fire protection installation services and those that claim to offer such services without a recognised standard of competency, can and does lead to inappropriate installations. If not detected, these will result in a building that is not fit for purpose in terms of smoke and fire performance.

If you are involved in the provision of fire protection, at any level, then you share liability for its usefulness and its operation when it is needed in fire, and that liability will still be there in the event of a court case. If it is your responsibility to specify materials and/or appoint the installation contractor, it is also your responsibility to ensure that they can prove competency for the fire protection materials used, or the works to be carried out. If you are a manufacturer of fire protection products, it is your responsibility to show that they are fit for purpose and will provide the required fire performance, usually through a rigorous programme of fire testing and third party certification. Likewise, if you are an installer of fire protection systems it is of equal importance that you can demonstrate your level of competence.

From an ASFP perspective, a competent person is one who can demonstrate to a third party that they have the expertise, skills and commitment for the professional installation of passive fire protection products, which means one who either:

- Works for a third-party certificated installer under the conditions of that scheme; or
- Within the UK has demonstrated to a certification body running a UKAS-accredited competent person scheme to EN ISO 17024 (Personnel Certification), competence in the installation of passive fire protection.





Those fire protection installers that have achieved third party certification status are required to use trained staff whose competence has been evaluated, whose records are subject to audit by the certification body and whose work is subject to random inspection by qualified inspectors. All ASFP contracting members must have attained appropriate third-party certification status before they can become a member of the Association. Many clients, specifiers, enforcement authorities and others responsible for fire safety, such as the Responsible Person under the Regulatory Reform (Fire Safety) Order, also now recognise that to allow installers to self-certify their own work is not considered sufficient or acceptable.



Pic ©Shutterstock.com

### Construction & Maintenance – the Third Side of the Triangle

Over the lifespan of any building, many changes are likely to be made, not only to the existing fabric of the building but through its potential change of use, essential maintenance and updating or expansion. It follows therefore that on-going and regular assessments of the fire safety measures within a building are undertaken to ensure that appropriate fire safety provision is maintained.

Risk assessment for passive 'built-in' fire protection is often not a straight-forward exercise. Many of the fire protection measures involved, such as the make-up of the fabric of the envelope of the building, or at a smaller scale, the detail of the fire stopping measures, may not be determined by an 'on the ground' visual inspection. Often such measures may be hidden above a suspended ceiling or within a cavity and, in some cases, may even be sited inside other components not obviously recognised as fire protection – for example, a fire damper within an air ventilation ducting system.

Many follow-on trades may unwittingly destroy essential fire compartmentation provision, since, to the untrained eye, a hole in the wall may just be seen as a maintenance issue.

The following factors can affect the in-service performance of such products or systems:

- **In-service Environment.**

The nature of the environment to which the product or system will be exposed may affect its durability or performance in a fire situation.

- **Planned Maintenance, Records & Reports.**

In most cases, correctly applied or installed passive fire protection products or systems used internally in buildings should not require significant maintenance over the design life of the building, other than where mechanical damage or subsequent modification has occurred. However, periodic inspections should be carried out as part of the normal maintenance plan for the building with any damaged passive fire protection measures either replaced, or where appropriate, repaired in the same way as in the original manufacturers' specification.

In some cases, it may not be possible to replace or repair with the same manufacturer's products, since the originally installed product may no longer be available. In such cases, a

professional opinion should be sought before mixing and matching materials and products from different manufacturers. Some features, such as fire-resisting ducts and fire doors, will require regular operational checks. Fire dampers, for example, should be inspected and operated at least annually and fire resisting ducts should be checked for the build-up of grease/rubbish.

Keeping detailed and accurate records is vital and should be seen as an essential management requirement.

- **Refurbishment or Upgrading of Passive Fire Protection Measures.**

The ASFP recommends that the refurbishment or upgrading of fire protection systems shall always be carried out in accordance with the advice of the system manufacturer, and installed by a specialist third party certificated contractor.

Given the arguments expressed above, it is clear that there are many essential elements to consider when considering fire safety within the built environment. Controlling the elements in the triangle of fire will prevent a fire from starting or help to extinguish it; while controlling the elements within the triangle of construction will prevent the spread of fire and smoke.

### Look for the Logo

The Association for Specialist Fire Protection comprises manufacturers and installers of passive fire protection products and systems. To be a member, manufacturers are required to hold third-party product certification for any products that are listed in ASFP publications. ASFP contractor members are required to hold third-party certification for the installation of such products. The assurances gained by using an ASFP manufacturer or contractor will ensure the installation of passive fire protection that is fit for purpose. Look for the logo.

The Association for Specialist Fire Protection offers detailed guidance on fire testing, specification and installation of the following passive fire protection groups:

- Structural steel fire protection.
- Fire stopping, fire seals and cavity barriers.
- Non load bearing partition systems.
- Fire retardant coatings.
- Fire resisting ducts and dampers.
- Fire resisting walls and linings.
- Fire risk assessment of passive fire protection. **IFP**

**Wilf Butcher** is CEO of the Association for Specialist Fire Protection

For further information, go to [www.asfp.org.uk](http://www.asfp.org.uk)

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**Fred Hildebrandt**

Janus Fire Systems

# Sustainable Fire Suppression

Modern society relies heavily upon interconnectivity. The word infrastructure is no longer restricted to traditional means of conveyance such as roads. When used in 2014 vernacular it typically refers to networks that keep our interconnected society moving at a rapid pace.

In a recent *Information Age* discussion, the cost of data loss through a security breach was said to average US\$860,273.00. Considering this fact, if the equipment for storing, processing, and transmitting this data were impaired or destroyed by fire, one can assume costs would escalate dramatically. The equipment that ensures successful completion of transactions sits in modern citadels, loosely referred to as data centres, telecom facilities, server sites, and colocation sites situated in facilities in virtually every community. IT professionals are keenly attuned to actions taken by intruders hacking into their prized networks. Faced with those risks, CIOs and IT professionals sometimes relegate the risk of fire to a lower priority. That fact, coupled with the wide range of available products could lead to them delaying the fire protection decision rather than making what they perceive to be the wrong choice. However, the fire protection industry offers a variety of solutions based specifically on the needs of our modern IT sector.

It is important to recognise that all clean agent fire protection options share the following attributes:

- Safe for human interaction.
- Three dimensional.
- Quick-acting fire extinguishment, in some cases within seconds.
- Does not leave residue upon discharge.
- Electrically non-conductive.
- Global availability.
- Tested and approved by globally recognised testing agencies using accepted standards.

Typically, systems utilising Clean Agents as described in NFPA 2001-2012 edition fall into the following three categories (see table).

## Comparison of Inert Gases, Halocarbons & Perfluorinated Ketones

The higher volumetric concentration requirements of inert gas agents, along with the differing physi-



cal properties of the inert gases compared with the halocarbon and perfluorinated ketone agents has a significant impact on system design and cost. The inert gas agents cannot be compressed to the liquid state (at normal handling temperatures), and must be stored as a gas. In order to store the gases efficiently they must be compressed to much higher pressures, which necessitate the use of high pressure storage cylinders, adding cost to inert gas suppression systems. The low volumetric efficiency of the inert gas agents and their inability to be stored as liquids requires a larger number of cylinders compared with other clean agent systems. This requires additional storage space and an increased system footprint.

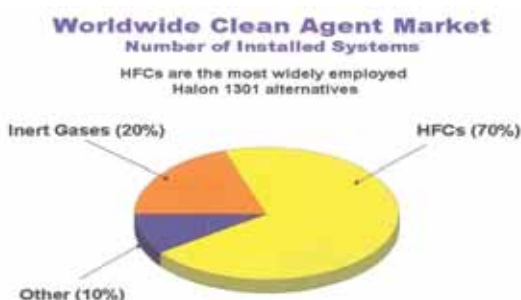
In contrast to the inert gas systems, the halogenated and perfluorinated ketone agents can be stored as liquids, allowing for a much larger mass of agent to be stored in the same volume compared to

	Designation	Chemical Formula	Trade Name	Manufacturer
HFC's	HFC-227ea	CF <sub>3</sub> CHFCF <sub>3</sub>	FM-200®	DuPont
Inert Gases	IG-541	N <sub>2</sub> (52%) Ar (40%) CO <sub>2</sub> (8%)	Inergen®	Ansul
	IG-55	N <sub>2</sub> (50%), Ar (50%)	Argonite™ Proinert®	Ginge-Kerr Fike Corp.
	IG-01	Ar	Argotec	Minimax
	IG-100	N <sub>2</sub>	NN100	Koatsu
Perfluorinated Ketone	FK-5-1-12	CF <sub>3</sub> CF <sub>2</sub> C(O)CF(CF <sub>3</sub> ) <sub>2</sub>	Novec™-1230	3M



inert gases. This significantly reduces the required number of cylinders. In addition the most widely used halocarbon and perfluorinated ketone agents can be stored in light wall low pressure cylinders and employ standard schedule 40 or equal steel pipe. Typical pressures of inert gas systems are 150 bar, 200 bar, and 300 bar, whereas halogenated and perfluorinated ketone agents are typically stored in welded seam cylinders pressurized with nitrogen to 25 bar and 35 bar, spun steel cylinders are utilized for 42 bar or 50 bar systems.

For Class A, Class B, and Class C hazards the choice between an inert gas or halogenated and perfluorinated ketone agent typically involves the owner/customer, specifying engineer, authority having jurisdiction, fire protection supplier or collaboration between all parties. Where Class D hazards are involved, specific inert gases become the only choice for a total flooding agent.



In an effort to be as concise as possible, we have limited our references to the most widely used products: HFC 227ea (FM-200), inert gases and perfluorinated ketone FK-5-1-12 (Novec 1230 fluid).

### HFC 227ea (FM-200) Systems

HFC 227ea (FM-200) was one of the first in a series of agents to be accepted by the U.S. EPA (Environmental Protection Agency) Significant New Alternatives Program, as a replacement for Halon 1301 in total flooding applications, and has been installed widely around the world. Fire extinguishment occurs by heat absorption removing enough heat so that the fire can no longer sustain itself. The safety factor between design concentration and LOAEL (Lowest Observable Adverse Effect Level) is 36 percent. Spot market shortages were experienced in 2012 but have been rectified and the supply of equipment and agent for new systems or recharge is currently available globally.

Environmental regulations have increased costs in some regions but it is important to recognise that contributions to climate change from HFC's in fire extinguishing applications is less than 0.01 percent based upon data from the U.S. EPA and EU-15 Countries. Regulatory bodies have been treating HFC's in fire suppression differently than other applications where those in other industry segments, such as refrigeration, dwarf fire suppression emissions. The F-Gas regulation in Europe has adopted, supported and regulated good industry practices around filling, recharging and servicing fire extinguishing systems equipment.

### Inert Gas Systems

Inert Gas systems utilise a single gas or blends of gases to affect fire extinguishment, largely due to removal of heat and oxygen reduction. Gas blends assist in the retention of agent in the protected space by approximating the density of breathing air. Specific egress and exposure times must be

followed depending upon the minimum system design concentration.

The majority of systems use an orifice plate to reduce the high storage pressure of the gas to a more suitable pressure for the piping network. Pressures upstream of the main orifice are extremely high and will typically require the use of high strength materials. The manufacturer's piping guidelines must be followed to ensure safe operation of the system. Recent cylinder valve designs regulate the flow of gas at the cylinder allowing the wider use of standard wall piping in the system.

Once again the manufacturer's guidelines must be followed. Space allocation and overall weight of cylinders is a key consideration when installing an inert gas system. If the protected space is modified, a reduction of the volume could be detrimental to the life safety due to increase of the volumetric concentration of the agent and must be reviewed by a competent fire protection professional; in addition, room pressure venting must also be provided when using any inert gas even with revisions of discharge times as outlined in paragraph 5.7.1.2.2 of NFPA 2001, 2012 edition.

### Novec 1230 Fire Protection Fluid

The latest entrant into the global clean agent fire extinguishing systems market is FK-5-1-12 (Novec 1230). This product extinguishes fire primarily by heat absorption and has garnered wide global acceptance as it has the highest safety factor between design concentration and Lowest Observable Adverse Effect Level, 67 percent to 122 percent based upon hazard classification. 3M has increased manufacturing capacity to assure adequate supplies for new systems or recharges of existing systems. It has an extremely low Global Warming Potential of 1, very low atmospheric lifetime of five days and is included in the EPA Significant New Alternatives Program approved for total flooding systems 12/20/02.

Novec 1230 [FK-5-1-12] is unique in that its vapour pressure is very low at ambient temperatures. This gives the system designer an opportunity to consider use of higher nitrogen pressures when using light wall welded seam cylinders designed to U.S. Department of Transportation standards up to nominal 34bar pressure (systems employing pressures higher than 34bar nominal may require the use of higher rated pressure cylinder). This increased nitrogen pressure and updated hydraulic calculations dramatically improves the flow of agent in piping networks associated with clean agent fire extinguishing systems. Standard wall pipe and fittings are typically used to install the systems in accordance with the manufacturer's design manuals.

Clean agent fire protection dates back to 1947 when the U.S. Army sponsored research at Purdue University in West Lafayette, Indiana to develop an extinguishing agent with low toxicity and high fire extinguishing effectiveness. That research led to the commercialisation of Halon 1301, the production of which ceased as part of the Montreal Protocol; however, it is important to recognise that civil and military aircraft continue to rely on Halon 1301 systems in engine nacelles, cargo bays and lavatory waste bins. It is highly unlikely that even those far-sighted professionals could imagine the ways we use data in our daily lives. And yet their research provides the vision we must continue to embrace when protecting the high value assets that form the backbone of our interconnected society. **IFP**

**Fred Hildebrandt** is Director of Sales at Janus Fire Systems

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# High-Rise Fire Saf

*Pic courtesy of Escape  
Rescue Systems*



**Graham Collins**

Email: [graham.collins@mdmpublishing.com](mailto:graham.collins@mdmpublishing.com)

Every time we see the horrifying images of the World Trade Centre's twin towers disintegrating in front of our eyes, we must surely ponder the terror and dread experienced by those trapped in the buildings in the seconds before they died. It has left a legacy in terms of the challenges of high-rise building safety that are as real today as they were in 2001. And the question is still being asked: "How can people trapped in these buildings be evacuated?"

Achieving safe evacuation from any building is a challenge, but probably not more so than in high-rise structures that today punctuate the skyline of just about every major city across the world. The reality is that designing and constructing new buildings to achieve total safety in the event of a major fire or terrorist explosion is just about impossible; with many existing high-rise buildings the situation is even worse – we have no option but to work to overcome any barriers to safe evacuation that may have been designed-in. The inevitable consequence is that considerable time and energy has gone into devising evacuation and safety solutions that overcome these challenges or at least go some way towards minimising the casualty toll.

However, before deciding on a solution – be it a partial or complete solution – it is important to take a close look at the nature of high-rise buildings and how we behave in them in an emergency. The World Trade Centre tragedy in New York is probably the most researched and analysed

evacuation challenge of all time, so what barriers to safe evacuation have been exposed?

Evacuation via a staircase is, in many instances, the only available option. However, the limited capacity of stairs in relation to the potential number of people attempting to escape means that, even if the staircases have not been engulfed in toxic smoke and flames and are a safe exit route, it will soon become gridlocked by an ever-increasing number of people attempting to reach safety. This, in itself will increase panic and may well lead to life-threatening crushes. It will also inevitably deny firefighter access to the fire, potentially resulting in it spreading and entrapping more people in higher floors in the building.

This reliance on stairs for safe evacuation is, of course, even more questionable for any unaided physically or mentally disabled occupants that may be wheelchair-bound, partially sighted, blind or deaf. The problem is not really eased where elevators are still in operation. While some high-rise buildings do incorporate shelter-in-place "areas of



refuge” their capacity is limited and, in the case of the World Trade Centre collapses, would have proved to be valueless. In the majority of cases, shelter-in-place facilities still require the occupants to be evacuated at some stage.

Phased evacuation, aided by the use of voice alarm systems, can and does make a valuable contribution towards effective evacuation. This phased evacuation option is, of course, unavailable to those trapped and isolated above the fire – as was the case for many in 9/11 – and, in any event, time may simply not permit the phasing to be fully accomplished before lives are lost. It is worth remembering that, for those lucky enough to escape the World Trade Centre buildings in New York, the mean length of time to descend to the ground for the WTC 1 building was 40 minutes and for the WTC 2 building was 22 minutes.

### Evacuation Options

In an attempt to offset these challenges, fire engineers, architects, developers, owners and occupiers of buildings are looking at alternative options to achieve safe and swift evacuation from high-rise buildings, and a number of solutions are now available. It has to be pointed out however that each solution has to take into account the particular design characteristics of the building for which it is intended.

In some instances, the challenges increase as the number of floors gets greater and as the building gets higher. Some solutions are focused solely on the safe evacuation of single occupants, others on evacuation groups of people, while others still additionally assist the emergency services in delivering firefighters and firefighting equipment to the upper floors of a building.

The available solutions fall into two general categories: equipment for the “internal” evacuation of individuals, and systems for the supplementary external evacuation of greater numbers of building occupants. Equipment designed for “internal” evacuation tends to be aimed at safely evacuating single mobility impaired or handicapped individuals. While this undoubtedly performs an important function, such equipment is not capable of evacuating large numbers of people from a building that, potentially, is at risk of being engulfed in fire or of imminent collapse.

### Supplementary External Evacuation

While there are other systems on the market, such as escape chutes and rescue climbers, the most popular supplementary external evacuation systems generally comprise either controlled decent devices or platform rescue systems. One of the leading manufacturers in the former field is a US-based organisation, High Rise Escape Systems ([www.hres.com](http://www.hres.com)); another US-based company, Escape Rescue Systems ([www.escape-rescue.com](http://www.escape-rescue.com)) is a leading exponent of platform rescue systems.

#### ● Controlled Descent Devices

Controlled descent devices or CDDs look like, and

work in a similar way to a pulley – as one side goes down lowering the building’s occupant in a protective “evacuation suit” that offers flame and heat protection, the other side comes up ready for the next user. This process is repeated until all occupants have been evacuated. The CCD descends at a speed of between one and two metres a second, meaning that a descent from 20 floors up takes around just 60 seconds. They have either portable or fixed-mounted anchoring systems to allow for rapid “pre-planned” or speedy “unplanned” attachment to the structure.

#### ● Platform Rescue Systems

Platform rescue systems (PRS) move vertically along guides or other means on the exterior of a building and operate in much the same way as an elevator or lift. They are installed inconspicuously on the roof of a high-rise building and, during an emergency, cabins automatically deploy and lower to the street level.

First responders board as they arrive at ground level and control the fire-protective cabins as appropriate for the given emergency. They can deliver up heavy hose loads, fresh air tanks and much needed supplies, while evacuating people on the way down. These systems can evacuate dozens of people from different floors simultaneously, and some can hold up to 30 people in each cabin and incorporate up to five cabins. The system repeats this cycle, transporting firefighters and equipment up and into the building and evacuating building occupants to safety.

### A Culture of Safety

Safe evacuation relies on more than merely having the equipment in place.

Good housekeeping is absolutely essential to ensure that evacuation routes are not blocked, that emergency lighting is in perfect working order, and that there is an accurate head-count of the people in the building at any one time. Signing-in and signing-out may be irksome, but it avoids risking firefighters’ lives seeking for someone that may not even be in the building. Communication is also imperative.

Also important is for the building’s occupants to be fully aware of the evacuation procedures and equipment that is in place; for that, training is vital. It is, with the wisdom of hindsight, astonishing that in “The World Trade Centre Evacuation Study”, Principal Investigator, Robyn R.M. Gershon, stated that 94 percent of the World Trade Centre’s occupants had never exited the building as part of a drill, that 82 percent had never been provided with evacuation plans, and that 74 percent were never provided with written fire safety instructions. He went on to conclude that the factors significantly associated with length of time to evacuate included a low level of knowledge, a lack of emergency preparedness, multiple sources of information, and overcrowding on stairs or in lobbies.

There are lessons there for all of us.

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For further information, go to [www.hres.com](http://www.hres.com) or [www.escape-rescue.com](http://www.escape-rescue.com)

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*Picv courtesy of Koffel Associates*



# Maintaining Your Fire Protection System

## – Who is Responsible?



**William E. Koffel**

Koffel Associates

The answer to the question regarding who is responsible for maintaining the fire protection system once installed appears to be quite obvious and simple. Most codes, including reference standards such as NFPA 25 and NFPA 72, clearly state that the owner is responsible for maintaining the fire protection systems and that the owner may delegate that responsibility, in writing, to the occupant if the owner is not the occupant.

**W**hile some owners will use facility personnel to perform the required inspection, testing, and maintenance (ITM), many owners contract the services to a firm that specializes in providing such services. Sounds simple and straightforward, but there appear to be some gaps in the process.

### Identifying the Problem Areas

Over the past several revision cycles, the NFPA Technical Committee on Inspection, Testing, and Maintenance of water-based fire protection sys-

tems has processed numerous proposals and comments addressing the responsibilities of the owner and the inspector. In an attempt to address the issue more completely, the Fire Protection Research Foundation conducted a symposium during which the issues raised in previous revision cycles could be discussed in an open forum.

The final report from the Symposium is not yet available but will be posted on the Foundation website when it is complete. As such, any representation of concepts presented during the Symposium should be considered as my observations



## SYSTEM MAINTENANCE

*Pic courtesy of  
Graham Collins*



as a participant in the program.

The normal “wear and tear” type items that occur for any system are addressed by the various standards that detail the inspection, testing, and maintenance of such components. These would include items such as the operation of a control valve, the testing of the performance of a fire pump, and evaluating whether a standpipe system can deliver the required flow at the required pressure. Thinking beyond water-based fire protection systems, these also include whether the initiating devices on a fire alarm system work, dampers close or open as required for a smoke control system, and if there is enough agent in a special suppression system.

However, during the design of any fire protection system, the engineer designing the system makes various assumptions about the use and occupancy of a space and in the case of water-based fire protection systems, the adequacy of the water supply. Any changes or modifications made by the owner may impact the ability of the fire protection system to perform as intended. This was clearly one area of concern raised during the Symposium along with errors made during the initial design or installation of the system.

### **Design and Installation Errors**

It is generally assumed that fire protection systems will be properly designed and installed. To the extent that this is not the case, most standards that deal with ITM procedures do not require such features to be re-evaluated on a periodic basis. If

an error occurs during design or installation it should have been caught during plan review, installation, or during the acceptance procedures or commissioning. For example, NFPA 25 contains language that states:

1.1.3.1 This standard does not require the inspector to verify the adequacy of the design of the system.

An Annex note for that paragraph indicates that the owner should evaluate the adequacy of the design of the system when changes are made that might impact the performance of the system.

The question that often arises is to what extent the inspector referenced in paragraph 1.1.3.1 should identify design and installation errors. It is generally accepted that owners probably do not want to pay for a complete re-evaluation of the system on a regular basis. It is also generally understood that an inspector may not be aware of alternative methods that were considered during the design process and also may not even know the applicable standard at the time of design and installation. As such, at this time a complete re-evaluation of systems on a regular basis is not required by most codes or the reference standards.

What if the design or installation error is in plain view while performing a required inspection activity? For example, what if a sprinkler is not provided in a space wherein sprinklers would normally be required? Paragraph 1.1.3.1 above would say that the inspector is not required to identify the lack of a sprinkler in the space. The NFPA Technical Committee has acted on proposals and comments to

say that the inspector should not be required to inspect for areas where sprinklers are not provided. Does that mean that the contractor does not have a responsibility to report the lack of a sprinkler in space? If the contractor does not, who will? At the Symposium representatives for regulatory agencies and insurance companies commented that their resources are decreasing, so one cannot depend on those resources to identify such problems.

While not wanting to pay for a complete re-evaluation, some building owners will say that they know very little to nothing about fire protection systems and therefore rely on the contractor to identify such potential deficiencies. If the contractor observes and reports one such condition but fails to observe another, are they negligent? Will identifying the space that is without a sprinkler in a separate report containing the necessary language that the inspector has not performed a thorough re-evaluation of the system satisfy the legal system? Some attorneys will argue that any attempt to notify the owner of such potential problems, while not identifying all, will subject the inspector to litigation should a system fail to operate as intended.

As you can see, when considering all perspectives, this is not an easy issue to address. Considerable input was received during the Symposium and the NFPA Technical Committee will now consider the discussions during the next revision cycle. There did seem to be general consensus among the Symposium participants that communication between the owner and inspector could be improved so that the owner had a better understanding of the services being provided and what is not provided. For example, some system inspection reports clearly state that pitch of the pipe in a dry pipe sprinkler system is not included in the standard inspection protocol but it could be for an additional fee should the owner desire to have the pitch confirmed. Some insurance companies have launched programs to better educate the owner regarding the fire protection systems in their building.

### Management of Change

Changes in a building or system that involve some construction activity or change of occupancy classification generally require a permit for the construction activity. Such changes are generally subject to some regulatory action that may involve plan reviews, inspections, and acceptance tests or commissioning, with some level of involvement by one or more regulatory agencies. The appropriate changes in the fire protection systems resulting from such activities should be caught, the same as would be expected for the construction of a new building or the installation of a new fire protection system.

What about the changes in use, process, or materials that can occur without any construction activity? NFPA 13 defines the commodity class for the storage of frozen foods in non-waxed, non-plastic packaging as a Class I commodity. If the same frozen food product is stored in waxed-paper containers in cartons, it is a Class II commodity. If the food is stored on plastic trays, it is a Class III commodity. If the wood pallets are changed to plastic pallets for food stored on plastic trays, the commodity classification is Class IV or

Group A Plastics depending the fire performance of the plastic pallets. In other words, the appropriate commodity classification for the storage of frozen food products is clearly "It Depends."

How many warehouse owners or operators will recognise the need to have the fire protection system re-evaluated based upon changes in the packaging or the pallets? Again, the regulatory officials and insurance companies have stated that reduced resources will limit their ability to identify such changes. The issue is considered a design issue, so the inspector is not required to evaluate what, if any, changes have occurred in the commodity classification of items stored in a warehouse.

While much of the current discussion is focused on NFPA 25, these issues are not limited to automatic sprinkler systems. Changes in the interior finish can impact the audibility of a fire alarm system. Adding partitions within a room with no change in room volume can still impact the effectiveness of a special hazard fire suppression system.

### Retro-commissioning

Based upon the situations identified above plus many others, some will argue that fire protection systems should be subject to a retro-commissioning process. The retro-commissioning process would confirm that changes have not occurred due to construction or changes in the use, process, or materials. Procedures commonly used to test systems, such as disabling certain control functions during the testing of the fire alarm system, are also being used as a reason for retro-commissioning.

The possibility of required retro-commissioning of fire protection systems raises another series of questions. At what frequency should the retro-commissioning occur? Should it vary based upon the occupancy classification or a risk assessment? Will the benefit outweigh the costs and inconvenience of performing retro-commissioning? Is the performance of fire protection systems acceptable or is it expected to decline for some reason?

### Summary

Maybe the only definitive statement resulting from this article is that the owner is responsible for the proper inspection, testing, and maintenance of fire protection systems. Decreasing resources are limiting the ability for regulatory agencies and insurance companies to assist the owner in fulfilling that responsibility.

Liability concerns may be preventing at least some inspectors from identifying potential design or installation errors. Lastly, there needs to be a process in place to address or manage changes that may adversely impact the performance of fire protection systems. While the management of change is the owner's responsibility, they may not have enough knowledge to truly address the problem.

While the respective committees that develop the standards that address inspection, testing, maintenance, and possibly retro-commissioning continue to evaluate the problem and attempt to identify solutions, owners need to be aware of the level of service they are receiving from insurance companies, regulators, and inspectors and evaluate the adequacy of their preventive maintenance program.

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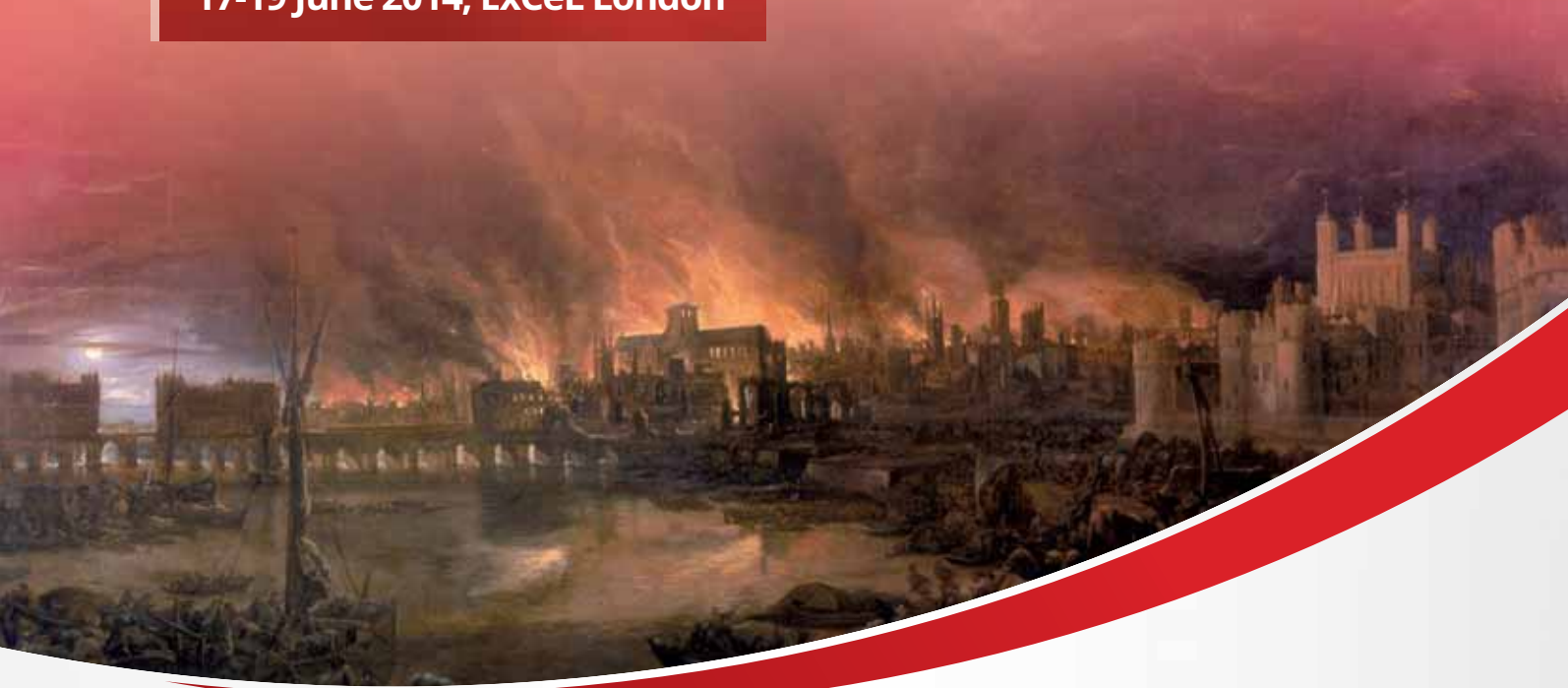
**William E. Koffel, P.E., FSFPE** is President of Koffel Associates, Inc. ([www.koffel.com](http://www.koffel.com)) and Chair, NFPA Technical Committee on the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems

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PPG Protective & Marine Coatings



# Passive Protection Offshore

Epoxy passive fire protection coatings continue to play an important role in fire safety for the petrochemical and offshore industries but how do they stand up to operation in very low temperatures?

**P**assve fire protection (PFP) coatings are used to protect marine offshore and other industrial structures from fire. They differ from active methods of protection in that they require no additional action, such as activation of a sprinkler system, to function. Several varieties of PFP are applied across different markets and applications. Epoxy-based PFP coatings are used where light weight, exterior durability and corrosion resistance are required, such as exterior structural steel in the offshore and petrochemical industries.

The chemistry of epoxy PFP coatings, their application and their typical end uses, mean unusual properties and operational requirements. Among these is the requirement for good adhesion well below room temperature – and well below normal service temperatures for other coatings. Hydrocarbon PFPs used in the petrochemical and offshore industries are often applied in extreme weather regions where temperatures reach as low as minus 40°C.

Until recently, there had been little published research available on the reactions of these coatings to extreme changes in temperature. As a result, PPG Protective and Marine Coatings undertook to examine the low temperature adhesion

and tensile strength properties of epoxy based intumescent coatings.

### Understanding Low Temperature Operations

Intumescent epoxy PFP coatings are usually mastic-based, meaning that they are applied at high film thickness. The thickness required can be 100 to 200 times that of a typical coating. Like most crosslinking coating systems, there is a net reduction in the volume of the coating on curing or drying that increases with crosslink density.

Because epoxies have a ring opening in the cure mechanism, they tend to have lower but still significant volume reduction compared with other coating chemistries. This shrinkage introduces residual stress within the coating, which increases with coating thickness and crosslink density. The net shrinkage in a system will also fluctuate with temperature – at higher temperatures, cross-linked coatings may continue to cure leading to a moderate increase in the internal stress of a coating. Organic materials have a larger temperature-related length fluctuation than metals, which becomes important when organic coatings are applied to metal substrates that are then subject

to heating and cooling.

Because epoxy PFP coatings can be used to protect exterior structural steel it is important to understand a coating's response to temperature variations.

It is typical to accelerate test results by exposing samples to higher than normal temperatures to take advantage of the increase in reaction rate with increased temperature. For example, salt fog testing, using ASTM B-1171 is run at 35°C, and accelerated UV exposure testing using ASTM G 154 can subject the test specimen to temperatures as high as 80°C. Because of this, high temperature behaviour of coatings is fairly well understood. However, in real-world applications, most exterior structures experience temperature well below 25°C and the behaviour of coatings at low temperatures is less well understood.

### Low Temperature Performance Testing

At their expected service temperatures, the amount of shrinkage in epoxy PFPs will be high, increasing the amount of internal stress. If the internal stress exceeds the adhesion force to the substrate, the coating may relieve this internal stress by dis-bonding from the substrate or cracking. Neither result is desirable and can compromise the integrity, durability, corrosion and fire protection properties of the PFP. But the question remains: do flexible PFP coatings maintain those flexible properties at low temperatures, and what happens to hard, brittle coatings as the temperature drops?

In order to test the low temperature properties of these coatings, two standard test methods were employed: tensile testing and lap shear testing.

Tensile testing determines the strength of materials by measuring the amount of force necessary to pull them until they break. Test methods such as ASTM D6383 use a sample shaped like a dog bone, with wide areas at the end for grip and a narrow test area with a known cross-sectional area. During the test, a sample of the coating is pulled at a constant rate, measuring the percentage elongation and maximum stress required to break the sample. Elongation is generally expected to decrease with decreasing temperature, while maximum stress typically increases.

At some temperatures, the polymer binder in the coating will pass its glass transition temperature, below which it will behave more like a glassy solid than an elastic solid. This means that below the glass transition, a coating will have more of a tendency to snap than to tear, and will often take more stress to break. However, the individual performance will vary based on the coating according to factors such as the architecture of the resin and the nature of the fillers used. It is therefore necessary to consider more absolute measurements like elongation at expected service temperature rather than simply noting whether a coating will be used below its glass transition.

Typical reporting properties for tensile tests are strain, maximum stress, and modulus. Strain, or percentage elongation, is simply a measure of how far a material can be pulled before it breaks, and is typically reported as a percent increase in length. Maximum stress or tensile strength has units of pressure, and is the amount of force used to break the sample divided by the cross sectional area in which the break happens. Modulus is often interpreted as a measure of the stiffness of a material.

As the slope of the stress/strain curve, it also has units of pressure.

Lap shear testing, described in ASTM D10024, is typically used for measuring the bond strength of adhesives. Two pieces of a stiff substrate, steel in the present study, are glued together using the subject material, and then pulled apart using the same equipment as a tensile test. The area of contact is either known or measured so that the force used to pull the sample apart can be normalized, similar to the known cross-sectional area used in tensile testing.

After testing, the failure is characterised as either adhesive (that is, the material pulling from the substrate) or cohesive (failure within the bulk of the subject material). The percentage of cohesive failure is typically reported along with the maximum stress, as in tensile testing. As with tensile testing, polymeric coatings or adhesives are expected to behave differently above and below their glass transition temperature.

To provide some conclusive data that could be used by industry when selecting appropriate systems, PPG undertook studies to explore the low temperature mechanical properties of PFP coatings.

### Conclusions and Areas for Future Study

Low temperature lap shear and tensile testing has shown differences in PFP coatings that may prove to be useful tools in predicting long term durability, adhesion, and resistance to stress induced cracking in thick film intumescent coatings.

The coatings selected for the PPG research were chosen deliberately to reflect extremes of possible real-world performance and reflected the expected behaviours. At lower temperatures, the elongation of hard, brittle coatings approached zero whereas the flexible coatings retained significant elongation. The flexible system increased substantially in tensile strength as the temperature decreased, surpassing the maximum strength of more brittle material at any temperature. The more flexible coatings tended to show less adhesive failure to the substrate in lap shear testing, but in all cases, adhesive failure (as opposed cohesive splitting within the coating) was most pronounced at the lowest temperature. These results match general expectations of coatings at low temperature.

Due to their chemical nature, epoxy coatings continue to cure throughout their service life. Coatings are typically tested once they have achieved an initial set after several days. This degree of cure is seldom fully measured or understood. A possible avenue of future research would be to determine cure by end group analysis and compare mechanical properties to measured degree of cure as the epoxy PFP is exposed to the standard NORSOK M-501 test method for durability and to measure low temperature properties.

In addition, it would be of interest to extend the low temperature lap shear study to blasted and primed substrates, in order to understand whether a surface profile might improve the stress results. Use of primers, especially low shear strength zinc rich primers, may show more telling differences at low temperatures. The results also indicate that PFP properties for temperatures above room temperature should also be explored since glass transition temperatures for some of the commercial coatings tested seem to occur around room temperature or slightly above.

IFP

**Daniel Brosch** is Global PFP Product Manager and **Paul Greigger** is Technical Manager for the Protective and Marine Coatings Group of PPG Industries

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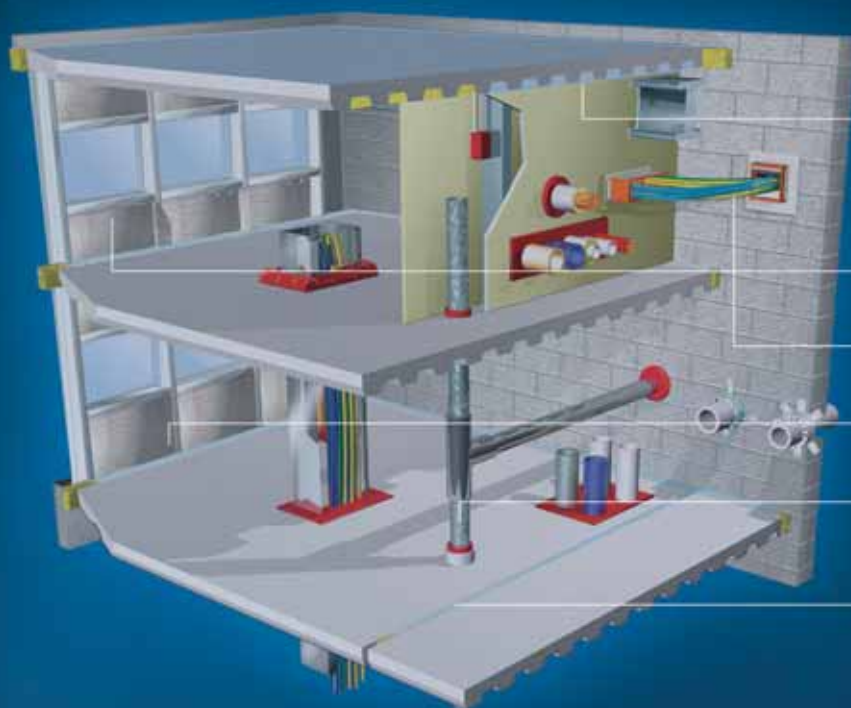
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# The Changing Face of Fire Detection



**Jim Spowart**

Eaton's Fire Systems

The options available to buyers of fire detection equipment are now more diverse than ever. This article looks at the range of technologies on the market and offers some advice on finding the most suitable solution for a particular situation, as well as assessing the likely impact of innovation and regulatory developments on the future of fire detection.

**T**he rapid evolution of fire detection technology means more lives are being saved than ever before. Moving on from the one-size-fits-all systems of the past, a wide array of solutions now exist to provide the best possible protection in a range of environments, each with their own characteristics.

It is now possible to detect any or all of the main indicators of fire, which are smoke, heat, carbon dioxide or carbon monoxide and even flame. However, while this increased level of sophistication represents a huge leap forward, it also presents buyers with a more difficult decision-making process because cost, scale, location, technology, regulation and risk assessment are all vital considerations in choosing the system that best serves the particular purpose.

## What are the Options?

Alarms that used ionisation were once the preferred option, but problems with their disposal in light of their radioactive components mean they have largely been rendered redundant and are

even banned in some countries. Instead optical smoke detectors were adopted as the most common solution. Inefficiencies caused by high air movements incorrectly activating the ionisation detectors have now been overcome by using optical systems as a standard choice. When smoke particles enter the chamber within the device, they disturb a beam of light and trigger the alarm. In many cases, these devices have been augmented over the past decade with the addition of heat detection elements to create a combined opto-thermal solution expanding the scope of fire detection across two important indicators; smoke and heat.

However, the ubiquitous use of such devices gave rise to a new challenge – a growing number of false alarms. In a kitchen, for example, the use of opto-thermal devices is problematic because of the heat that is ordinarily generated. These issues prompted many industry bodies to introduce training courses to help managers choose the right fire detection devices for a specific environment, although lack of expert knowledge remains a problem.



For example, regulations have changed in the UK over the past decade, relieving the fire services of responsibility for issuing fire safety certificates and giving local facilities managers the responsibility for conducting their own risk assessments. In many cases, with a poor understanding of their specific needs and how to match those needs with the systems available, they opted either for too many detectors, leading to issues with false alarms, or too few, leading to increased risk.

### Reducing False Alarms

Finding ways to overcome the costly and disruptive consequences of false alarms has been a continued focus for the fire detection industry, particularly where smoke alarms react to air particles other than smoke, such as steam. It is an issue that has proven particularly troublesome in food factories and hotel bathrooms for example, where continual false alarms place the emergency fire services under unnecessary pressure.

One answer lies in coupling smoke detectors with carbon monoxide (CO) detectors, so that an alarm is only triggered when both smoke and CO are detected. This more multi-layered approach, which could additionally incorporate heat detection as a third indicator of danger and even electronic algorithms to make the system more intelligent, is key to reducing false alarms. By incorporating multiple technologies into single systems the move towards comprehensive fire detection need not be highly expensive, which is

vital at a time when there is pressure to keep costs down while simultaneously improving the all-round effectiveness of fire detection.

Focusing on heat detection, there are now three accepted standards. One which measures the rate of the temperature rise to identify a fast-burning fire, another with a mid-range temperature limit of 70°C and a third with a higher temperature limit of 90°C. The first (A1R) is not suited to a kitchen where rapid temperature rises might be caused simply by opening an oven door. The second (BS) is better in a mid-sized kitchen and the third (CS) is more suited to an industrial kitchen. An additional option has emerged in the shape of analogue heat detectors. These are programmable and allow the user to select any of those three standard activation temperatures to suit their own needs.

More recently Eaton's Fire Systems, for example, has introduced a more flexible and cost-effective solution with its five-in-one detector incorporating optical and thermal elements including three levels of heat detection within the conventional panel product. Even more advanced has been the development of addressable fire detection, an intelligent loop system that allows larger buildings such as hospitals and hotels to narrow down the source of the fire alert to a particular room or area. This has the advantage of cutting down the time spent and distance covered by fire crews when searching a building for the origin of the fire alert. Another advantage of addressable systems is that the optical chamber can be deactivated during the day, for example, if work is underway that could generate smoke and lead to false alarms. This could then be reactivated overnight to provide protection.

### Developing Technologies

Innovation is responsible for solving a range of specific problems in fire detection. In kitchens, for instance, heat detection has long been a challenge, while refrigerated areas present their own set of problems with smoke detectors potentially mistaking condensation for smoke and activating a false alarm. The answer is an aspirating system that draws air into a set of pipes and samples it in a laser chamber to identify smoke particles. With adjustable sensitivity and filters, this ensures accuracy in specific environments. A similar solution can be used in lift shafts and other enclosed voids that are hard to reach, enabling a sample pipe to be fed down to floor level for the purpose of performing annual inspections.

The speed at which fires are detected is another area where technology development has enabled progress. For buildings such as large warehouses,

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the historic risk was that a smoke detector situated on a ceiling over ten meters from the floor might take too long to pick up on the rise of smoke, by which time a fire may have rapidly spread at ground level. The solution is the beam detector, which sends a beam of infrared (IR) light to a reflective surface, perhaps 100 meters away and an alarm is triggered if smoke interrupts the path of the beam. This technology is now undergoing further advances with the addition of motorised beam detectors that intelligently ensure the beam is accurately aligned and can cope with the barely perceptible structural shifts that can affect a building over time.

Another trend in larger buildings is the creation of networks, where separate fire detection panels are linked to provide a complete solution that will not be put fully out of action by a single fault within one part of it. An interesting development around this trend is that the data communicated between the panels can be fed into a building management system or a graphical package to give the relevant team of people a broad view of activity.

### Working with Regulations

Of course, regulatory changes have had a huge influence on the shape of fire detection today, and some of the most recent developments are concerned with the way alerts are communicated to people with hearing impairments or people in crowded and noisy environments.

In the EU, for instance, the EN54 standard for fire detection was recently updated with Part 23, which underlines the requirement for visual alarms at any site where, according to the findings of a risk assessment, there may be staff or visitors with hearing impairments or people wearing ear defenders. This regulation defines the necessary light output levels needed to provide a suitable visual alarm. However, general awareness remains relatively poor among many buyers and manufacturers.

A technical challenge to be overcome by many manufacturers is that they have typically focused

on minimising the electrical current used by fire detection devices in order to achieve optimal efficiency in operation. However, the power that is needed to drive visual alerts at the levels now required will force many producers to undertake a major review of the way their systems are built and run.

### Forecasting the Future

Expanding on the issue of alarms, one of the most significant areas of development we can expect to see over the coming months is the advancement of emergency voice alarm communications (EVAC).

If you take a shopping centre as an example, people's recognition of a fire alarm can be obscured by the array of individual security alarms within stores, along with other sounds and visual interferences. A voice system will not only clarify the nature of the alarm but can also help direct people out of a building with a customised set of automated instructions.

It is advisable to broadcast these instructions via a dedicated set of speakers, which have specific features that make them resistant to the effects of fire as opposed to a standard public address system where circuitry could be quickly damaged in a fire.

Further developments in this regard are likely to centre on refuge intercom systems. Unlike standard radio signals that can be impeded by ionised particles in the air, these emergency telephones will continue to operate and can be positioned on staircases, for example from which people with physical disabilities can call for help. For a similar circumstance, Eaton's Fire Systems business has recently introduced a complete alarm product for disabled toilets, whereby a pull cord provides a direct link into an emergency phone system.

It is with this kind of integrated thinking that fire detection is likely to develop, becoming ever more accurate across a wide range of circumstances and environments, more user-friendly and more comprehensive as a form of protection. **IFP**

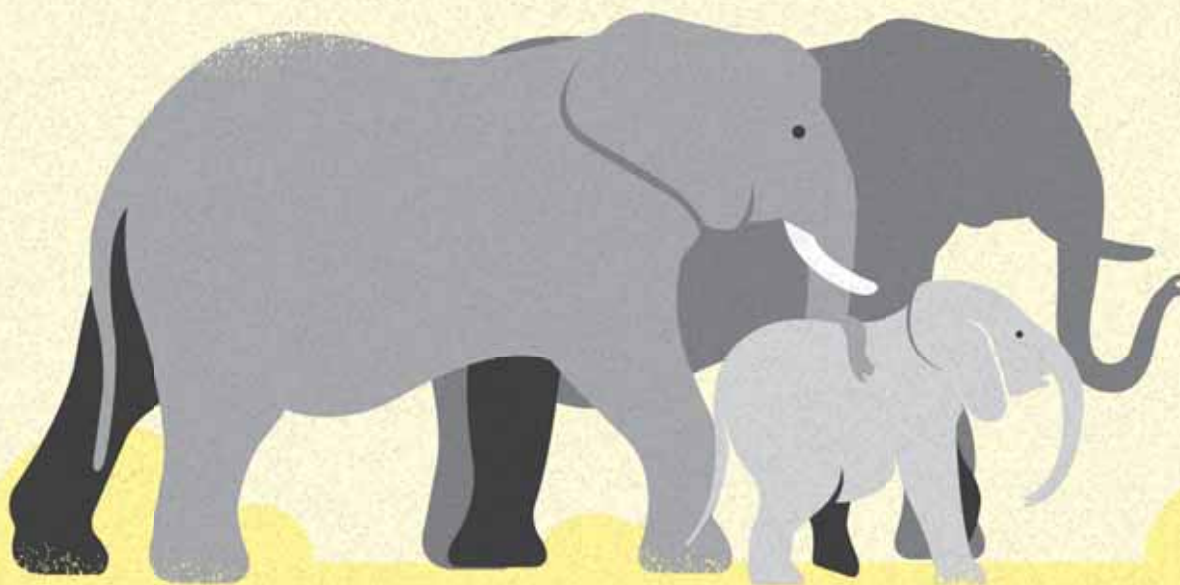
**Jim Spowart** is Senior Applications Engineer at Eaton's Fire Systems business

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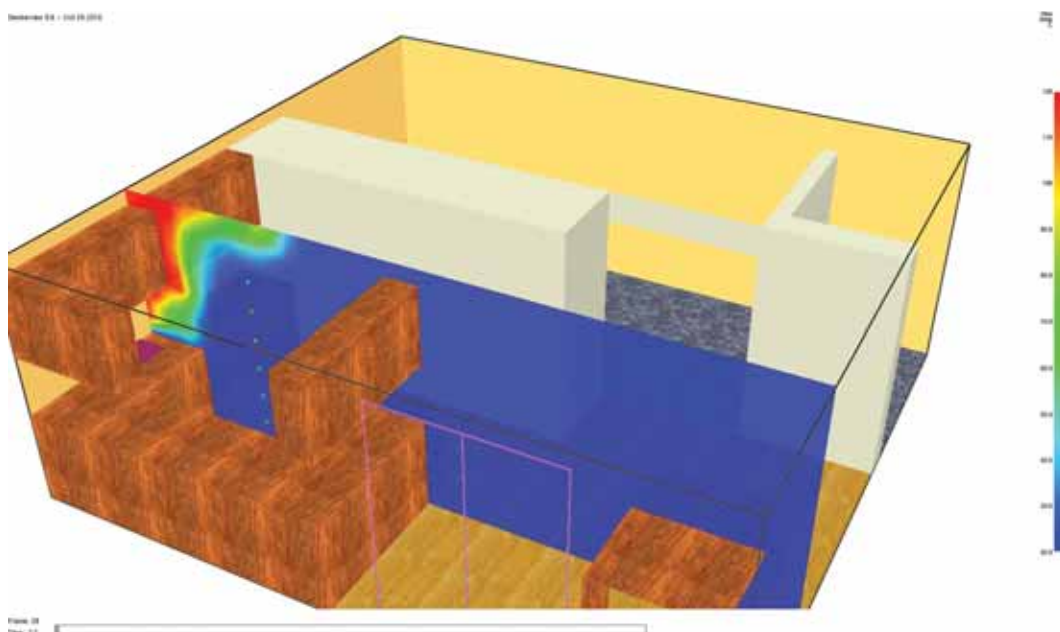
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# Comparing Low-Pressure Water Mist and Sprinklers



**Marijan  
Kamenjašević**

Zagreb Holding

Although stable systems for fire extinguishing with water mist have been known for decades, they were not used in south-east Europe until recently. In the past few years, several companies have engaged in designing and installing stable water mist systems, whereby finely dispersed droplets of water use physical properties more efficiently than conventional sprinkler systems. The water passes through special nozzles at a high working pressure and is atomised to sizes up to 1,000 microns. Due to the extremely small amount of water that is used, the potential for damage from water during fire is reduced to a minimum.

In this article I will deal with the difference between classic sprinkler systems and water mist systems using Computational fluid dynamics – usually abbreviated as CFD – a branch of fluid mechanics that uses numerical methods and algorithms to solve and analyse problems involving fluid flow. Computers are used to perform the calculations required to simulate the interaction of liquids and gases inside a defined area. The basis of almost all CFD models are the Navier-Stokes partial differential equations, which define any single-phase fluid flow.

For the purpose of this research Fire Dynamics Simulator (FDS) was used with the addition of the commercial version (2012) of the Pyrosim graphical interface (created by Thunderhead Engineering), developed for post-processing of the results obtained by modelling the FDS.

FDS models can predict smoke, temperature, carbon monoxide and other substances during the fire. Simulation results are used to verify the safety of the building before construction, evaluate the security options of existing buildings, carry out the reconstruction of fire during the investigation of fire causes and assist in the training of firefighters.

Pyrosim interface provides immediate feedback and ensures proper form for FDS output file. Both examples in this research are basically modified examples that come with PyroSim.

### Example One: The Living Room

Example One is a model of the development of a fire in a room that simulates a living room. The room dimensions are 5.2 metres by 4.6 metres by 2.4 metres high and its volume is 75.4 cubic metres. The whole unit is defined with a mesh structure consisting of a ten centimetre cell size and the total number of cells being 67,392. The source of the fire is on the central part of the sofa, and the heat release rate per area is 1000 kW/m<sup>2</sup>. Above the sofa is a classic sprinkler nozzle, while in the second situation the classic sprinkler is replaced with a water mist nozzle. Simulation time is 400 seconds.

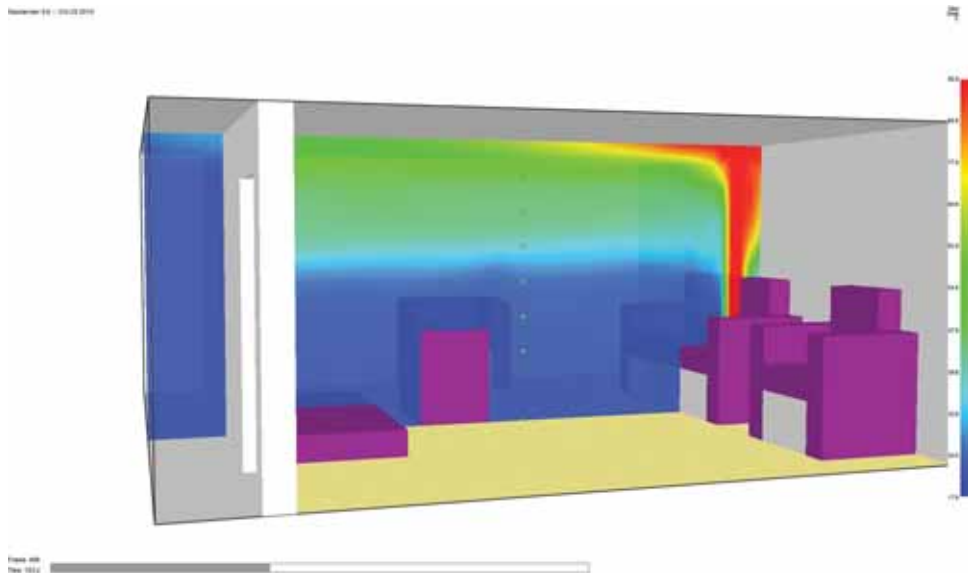
The sprinkler has the following specification:

- Activation temperature of the nozzle: 74°C.
- Droplet speed: 5 m/s.
- Number of droplets in one second: 5,000.
- Droplet diameter: 4.000 µm (4 mm).

The water mist nozzle has the following specification:



# Pressure Water Mist



- Activation temperature of the nozzle: 74°C.
- Operating pressure: 11 bar.
- Number of droplets in one second: 384,000.
- Droplet diameter: 500 µm.

In this example, both nozzles were activated after 165 seconds from the start of the fire, which was expected because in both cases the activation temperature was the same. In the case of the sprinkler the temperature gradually fell from 97.5°C to 65°C. After 200 seconds from the start of the fire, the temperature above the sofa decreased to approximately 70°C. The sprinkler successfully lowered the temperature and prevented further spread of the fire, but did not completely extinguish the fire on the sofa. Only a few seconds after the activation of the water mist nozzle, the temperature was lowered from 89.5°C to 45°C. After 200 seconds from the start of the fire, throughout the room the temperature dropped to 25°C. The water mist nozzle completely extinguished the fire in the room and lowered the overall temperature to 25°C.

## Example Two: The Kitchen

Example Two is a model of development of a fire in a room that simulates a kitchen. The room dimensions are 6.4 metres by 4 metres by 2.4 metres high and volume is 61.44 cubic metres. The whole unit is defined with the same size mesh as Example One, and the total number of cells is 245,760. In the middle of the kitchen is an installed classic sprinkler nozzle in the first case and, in the second, this is replaced by a water mist nozzle. Both nozzles have the same specifications as in the Example One. The source of the fire is set on top of one of the kitchen's cabinets, simulating fire from cooking stove. Simulation time is 400 seconds.

Both nozzles activated three seconds after the start of the fire. In the case of sprinkler the temperature was maintained between 80°C and 90°C until the end of the simulation. The sprinkler did not lower room temperature under 80°C, but it prevented further spread of the fire in the given

time. After activating, the water mist nozzle temperature was lowered from 74°C to 40°C. 30 seconds later the room temperature varied between 25°C and 40°C, and it did so until the end of the simulation. The water mist nozzle successfully lowered the temperature and prevented further spread of the fire in the given time. Although the fire was not extinguished until the end, the temperature was lowered to an acceptable level (between 25°C and 40°C) enabling the safe evacuation and easy access for firefighters.

## Conclusion

Based on the CFD modelling and analysis of the obtained temperatures, we can conclude that the water mist system is several times more efficient than the sprinkler system in residential areas (living rooms and kitchens). In the first example, water mist drastically lowered the overall temperature and almost completely extinguished the fire that originated on the couch. A similar conclusion can also be made for the second example. Although the water mist system did not completely extinguish the fire, it maintained it around 30°C until the end of the simulation, while the classic sprinkler failed to lower temperature below 90°C until the end of the simulation.

A water mist system must not be seen only as a system that effectively absorbs the heat in relation to the classic sprinkler, but as a system that creates a hypoxic environment. Due to rapid evaporation and expansion of water vapour, it leads to the displacement of oxygen and reducing its concentration. The intensity of the fire is decreasing significantly when reducing the percentage of oxygen in the atmosphere. Also, in the end, it is important to once again conclude that the water mist system with reduced temperature to a much lower level compared with the conventional sprinkler system in the shortest possible time. In this way, evacuation time of the affected area is increased and the damage caused by a fire is reduced.

**Marijan Kamenjašević** is a fire protection engineer in Zagreb holding

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IFP

*Pic courtesy of  
Graham Collins*

# The Special Life S Health Care Buildi



**William E. Koffel**

Koffel Associates

In many buildings, there may be some options with respect to the appropriate evacuation strategy to be used. However, in a health care facility the most common strategy is to defend the occupants in place.

**B**y definition, a health care occupancy is one in which the patients or residents are not necessarily capable of self-preservation during a fire emergency. Relocation of patients during an emergency requires considerable resources and time and potentially places patients at risk due to injury or the disruption in providing medical care. When evacuation is not a viable option, how does one provide an acceptable level of safety from fire? The purpose of this article is to provide an overview of the life safety requirements in US-based codes for health care occupancies.

### **Will Sprinklers Provide Life Safety?**

Prior to the 1991 Edition of NFPA 101, the Code permitted new health care occupancies to be built with or without automatic sprinkler protection. However, in 1987 the American Hospital Association commissioned an evaluation regarding the relative effectiveness of smoke detectors and automatic sprinklers in providing life safety to the occupants in a health care occupancy.

Based upon the risk assessment performed and subsequent full scale fire tests that validated the

results of the modelling, the American Hospital Association (AHA) recommended that the NFPA Committee on Safety to Life require automatic sprinkler protection for all new health care occupancies and any portion of a health care occupancy undergoing major renovation. Furthermore, AHA proposed that fast-response sprinklers be installed in all smoke compartments containing patient sleeping rooms. Today, building and life safety codes in the USA consider sprinkler protection as one of the critical fire protection and life safety features in new health care occupancies.

Based upon the modelling and full scale fire tests, fast response sprinklers are capable of maintaining tenability at the bed level in a typical patient sleeping room for most reasonably credible fire scenarios. However, to achieve an acceptable level of life safety and so as not to rely on a single protection feature, codes also require other protection strategies. Within the room of origin, these protection strategies include controlling ignition sources (smoking and portable heaters) above and beyond normal code provisions that address electrical equipment and systems. Loose hanging

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fabrics, such as draperies and cubicle curtains, are required to be flame retardant. The finish materials applied to the walls and ceilings of the room are regulated with respect to their ability to contribute to the spread of flame and the smoke that is released when the materials burn. Some codes will also regulate the ease of ignition and the heat release rate for newly introduced upholstered furnishings and mattresses. The combustibility and quantity of decorations is also limited to restrict the use of items that can be easily ignited or contribute to the growth of the fire.

## Compartmentation

With respect to compartmentation, the spread of smoke from a fire in a room separated from a corridor should be restricted from spreading into the corridor. Recognising that the sprinkler system will control the fire during many, but not all, fire incidents, the corridor wall is required to resist the passage of smoke. The door to the corridor is also required to resist the passage of smoke and to be equipped with latching hardware that will keep the door closed during a fire event. Although self-closing devices are effective in containing fire and smoke to the room of origin, corridor doors in health care occupancies are not required to be self-closing. The codes recognise the functional needs to keep the doors open and the presence of trained staff to close the door during a fire emergency.

corridor can be an avenue for fire and smoke spread. The corridor should also not be used as a source of supply air or a means of returning air to prevent the HVAC system from spreading smoke through the corridor. Patient treatment and sleeping should not occur within the corridor, thereby reducing the likelihood of patients being exposed to fire or smoke while in the corridor and potentially having no immediate place to which they can be relocated.

## Limited Relocation

If the previously mentioned features do not result in an adequate level of life safety during a fire incident, patients/residents may need to be relocated. The codes establish the need for smoke compartments in health care occupancies to limit the number of patients/residents that might be exposed to a fire and thereby need to be relocated. Smoke barriers are a construction feature that, in addition to having a fire resistance rating, are also constructed to resist the passage of smoke.

The doors protecting openings in a smoke compartment are to be constructed similar to a door having a 20-minute fire protection rating, however the door is not required to have a latch by some US codes. In a cross corridor situation, some fire doors would require a bottom latch and some codes have chosen to omit the latch, which may keep the door from closing completely. The weight of the door, the resistance offered by the closing

**Due to the nature of the occupants, it is critical that health care occupancies be designed, constructed, and operated in a manner that minimises the need to relocate patients/residents during a fire emergency. Staff require adequate resources to fulfil the responsibilities assigned in the emergency plan. So that staff can make the correct decisions, they need to understand the fire protection features of the building and what role they will play during a fire emergency.**

Rooms or spaces that are not separated from the corridor as indicated are typically limited in use (may not be a hazardous area), may be limited in size, may require visual supervision by staff, and may result in a requirement for smoke detection in the space or possibly throughout the corridor of the smoke compartment in which the room/space is located. For existing buildings, some codes will also allow restrictions on the fuel within the space as a compensatory feature to the space being open to the corridor.

There are some limitations on what equipment and furnishings may be in the corridor itself, again an attempt to minimise the likelihood that the

device, and the fact that the fire will typically be somewhat remote from the smoke barrier results in a door, even without a latch, being effective in controlling the spread of smoke.

Whereas some patients may need to be relocated from the smoke compartment of fire origin, codes generally limit the travel distance to the doors in the smoke compartment. The travel distance limit is intended to represent a reasonable distance that staff may need to carry or drag a patient until the patient is relocated into an area of refuge. In addition, adequate space must be provided on the other side of the smoke compartment for the patients/residents who might be



*Picv courtesy of Koffel Associates*



relocated from the adjacent smoke compartment. The smoke compartments must also be arranged so that patients/residents can continue to move towards an exit without returning to a smoke compartment from which they were relocated. Effective smoke compartmentation reduces the need for the vertical movement of patients/residents during a fire.

### Staff's Critical Role

In many cases, compliance with the code requirements related to construction, egress, fire protection systems, ignition sources, and contents and furnishings will result in an acceptable level of safety. However, the facility's emergency plan and the staff's ability to execute the plan, based on training and drills, will also be major factors in determining whether the consequences caused by a fire incident are considered acceptable. There have been numerous fires in health care facilities in which the response by staff has either resulted in a positive outcome or the response, or lack thereof, has contributed to a less desirable outcome.

During a survey of a health care facility, an administrator once told me that his staff was well trained and could evacuate the facility in slightly more than three minutes. He was referring to a fire event and not some external disaster that might result in the need to quickly evacuate the building. I was less than impressed by the statement. While staff might have been adequately trained to execute an evacuation in the stated time period, that should not have been the emergency plan and their training should not have been limited to total evacuation of the building. Based upon the location of the facility, it is unlikely that staff would really evacuate patients to the exterior during certain months of the year. Such an evacuation would also result in essentially discontinuing the delivery of patient care and treatment. Clearly the administrator, and most likely the facility staff, did not understand the construction

features of the building and how they can be used to help protect patients/residents in the case of a fire.

The administration of a facility needs to stress the importance of proper training and preparedness to all facility staff. Staff need to understand that they will play a significant role in the outcome of any emergency event, including a fire. Staff need to fully understand their responsibilities as outlined in the emergency plan. Use fire drills to not only ensure that staff can execute their responsibilities but to also evaluate the effectiveness of the emergency plan. If the plan calls for the patients/residents to be evacuated across a smoke barrier, does the plan provide for adequate resources to relocate those patients/residents in a timely manner? If not, how can the resources be increased or the plan revised to adequately deal with the emergency with the resources that will be available.

### Summary

Due to the nature of the occupants, it is critical that health care occupancies be designed, constructed, and operated in a manner that minimises the need to relocate patients/residents during a fire emergency. Part of the operational considerations is a well trained staff with adequate resources to fulfil the responsibilities assigned in the emergency plan. So that staff can make the correct decisions, they need to understand the fire protection features of the building and what role they will play during a fire emergency. Staff also needs a basic understanding of fire growth and development so they have an appreciation for how much time is available to protect or relocate the patients/residents. Recent US fire experience has shown that a properly designed, constructed, and maintained health care facility with an adequate number of properly trained staff will result in an acceptable outcome for most fire scenarios in a health care occupancy.

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**William E. Koffel, P.E., FSFPE** is President of Koffel Associates, Inc. ([www.koffel.com](http://www.koffel.com)) and a member of the NFPA Life Safety Technical Committee on Health Care Occupancies

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# The Function of Compartmentation

When dividing a structure into compartments there are many considerations to take into account, such as fire, sound, air, movement and water. Limiting or stopping the passage of these elements should be of the highest importance, particularly in residential buildings, schools and hospitals where any one of these elements could affect the occupants.

**Jessica Paling**

FSi Limited

**A**ny imperfection in an installed compartmentation system can create a weakness, and could have a detrimental impact on the performance of the protection provided. Weaknesses will compromise the seal, decreasing the protection from fire, sound, smoke, air, water or movement, allowing one or all of these to penetrate the compartment decreasing the pre-determined level of protection required.

In 2011 there were over 350 fire-related deaths, 18,000 injuries and over £6 billion in losses to UK industry, much of which would be avoidable with the correct provision of compartmentation. With many innovative products aiding the compartmentation of buildings the construction industry needs to be aware of their importance. They play a vital role in ensuring the safety of the building's occupants and minimising financial loss in the event of fire.

Built-in fire protection is a method of compartmentation. This incorporates the sealing of penetrations where there is a requirement for resistance against fire. Service penetrations create voids that need to be sealed using specialist fire

protection products. This protection is essential to the safety of individuals. Installing built-in fire protection increases the chances of escape while also decreasing the chance of structural damage.

Occupiers, specifiers and architects need to be aware that the products they select must be an integral part of a system. When an individual specifies or purchases a system he or she must ensure that the manufacturer has supplied the relevant certification and test data; the specified products then need to be installed in accordance with the manufacturers' guidelines, mixing and matching the products will cause data to become invalid. The manufacturer must provide evidence that the product being installed is precisely the same as the tested system. If a fire occurred liability would, in all probability, rest with the contractor. The FSi range of fire protection, for example, is manufactured to the highest and most relevant test standards, allowing up to 240 minutes fire resistance to EN 1366-3, EN 1366-4, and a variety of UL, ULc, AS and BS Standards. CE Marking adds to the already highly tested range.

Sound can travel between compartments via air



or the structure of the building. Airborne sound will travel through walls and floors while impact sound is more likely to apply to floors. For example, if two rooms or compartments share a concrete floor slab, vibration caused by impact or banging on that slab will travel easily. In most environments, impact on floors is more likely than impact on walls. In general airborne sound is the most important factor when considering compartmentation.

When a compartment wall is compromised by service penetrations, airborne sounds will travel between compartments through any voids that have been created. It is therefore important to seal these voids, and in most cases, the same methods can be implemented as used for fire stopping. Products that are tested for their sound reduction properties means that no additional products are required to control the passage of sound when sealing penetrations.

Reverberation is the persistence of sound within a compartment after the original sound is produced. A reverberation, is created when a sound is produced in an enclosed space causing a large number of echoes to build up and then decay as the sound is absorbed by the walls and air. The time taken for this sound to decay is known as reverberation time. This time can be reduced with materials that restrict the reflection of sound.

While there is no regulation for minimum levels of sound reduction in commercial buildings (other than from a health and safety perspective) it is important that acoustic isolation is considered. This is particularly important in offices and conference rooms where poor sound reduction may affect communication and concentration. FSi has acoustic test data for a wide range of our products and can predict how they will perform in any application. Acoustic test results are expressed as decibels of sound reduction;

that is, by how much the tested product reduces the transmission of sound between compartments. This makes it easy for everyone from the architect to end-user to satisfy regulations and specifications. The use of UKAS laboratories to test products to EN 10140 for acoustic isolation is the only way to ensure that test data is valid and accurate.

Another important part of compartmentation is ensuring the building is air tight. This aids the cost effectiveness of the running of the building by ensuring the room atmosphere stays in the correct compartment. This has a positive effect on the environmental credentials of a building. The UK government is proposing that each new building has a 60 percent reduction in carbon emissions; using air tight systems can help to achieve this. The same applies in most countries. Products tested to the air permeability standards EN1026 is one of the many standards that can be

used. British building regulations state that there must be no more than a 50 Pascal difference between internal and external pressure of a building –  $10\text{m}^3/\text{hr}/\text{m}^2@50\text{Pa}$ . Under the 2006 revision to Part L it is a regulatory requirement to conduct air permeability testing; without this, building control will not be able to issue completion certificate.

There can be a range of factors that can cause movement within a building, which includes thermal, seismic and subsidence. These issues will be most apparent in high-rise buildings, and without taking the movement of the building into account it could lead to systems failing and compartments being breached. There are systems on the market that can accommodate certain levels of movement within a building and in particular building elements. Movement is generally most apparent at the slab edge, curtain wall and head of wall. Perimeter seal cavity barriers should comply with EN 1366-4 Annex B, which tests movement under fire conditions.

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**Jessica Paling** is Business Development Executive at FSi Limited

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# Broken, but not Be The Future of Fire



**Simon Ince**

Warrington Certification



Passive fire protection in new builds – quality has to be caused; it also has to be controlled.

Charles Eames, the renowned American architect and designer once said: “Eventually everything connects: people, ideas, objects! The quality of those connections is the key to quality per se.” But what if, in the modern build cycle, these connections get broken, are weak or just never happen at all? The answer is that you get new buildings without adequate levels of built-in fire protection.

Unfortunately, in the current financial climate, price is putting increased pressure on every stage of the new build process, so much so that these vital connections are being broken. And the level of quality is then brought into question. Even when price is not the sole driver, there are many links in the chain of delivery. If one connection breaks, the integrity of fire protection in the finished building could be compromised to a dangerous degree.

There are many definitions of quality. However Henry Ford's is as close to the mark as any: “Quality means doing it right when no one is looking.” ‘Doing it right’, in this instance, simply means complying with the fire regulations in current building codes throughout the entire build process and on into the handover of the building.

Thus assuring that the structure is as ‘fire safe’ as can reasonably be expected. It does not mean over fire engineering, it does not mean using only high-end products, it does not mean having too much fire protection and it does not mean paying too much for fire safety. It just means doing the basics ‘right’.

It is quite a sad situation when just getting the basics right is a definition of ‘quality’ in the passive fire protection business. However it seems that, at every industry meeting I attend, in nearly every conversation I have with our certification clients, industry professionals, or indeed fire safety enforcement officers, many different examples of poor passive fire protection within different types of building stock get brought up time and time again.

### Can Fire Safe Buildings be Assured?

The connection between architect, fire engineers, main contractor, sub-contractor, additional service installers and building owner reminds me of a game I recently played at a family Christmas party.

‘Pass the mime’ is a game that anyone can play and nearly always ends up as a bit of fun. A card with a routine or common action written on it is

# yond Repair –



given to the first team member who reads it and, without speaking, he or she has to mime the action to the next one in line and so on along the team.

By the time it is passed to the last in line, he or she often has no idea what the original action was. At each stage the mime loses something, despite each person being convinced they are doing what was shown to them.

Little variations of interpretation with slightly diminished or exaggerated movements is fun for the audience to watch but often results in failure of the task. That 'failure in task' is great for a fun parlour game but, when fire safety depends on the original message getting all the way to the last person in the chain accurately, it is not a very successful model for the new build process.

## Where and How are these Connections in the Fire Safety Chain Going Wrong, and Why?

I have heard it said that "architectural plans are just a guide for the builder and should not be cast in concrete".

'Ideas' are what architects get paid for; originality, interesting concepts and the 'wow' factor are the icing on the cake, after the functionality and clients requirements have been met. Often to achieve both function and form, a varying degree of fire engineering is incorporated in the design and therefore into the project plans. Yet the architect and fire engineer are rarely appointed for

the entire build project and are therefore not there to see if their ideas were achieved. With no end-to-end continuity in the build process, one vital connection between the originators of an idea and the people who make it happen is already missing. It is like making a film from a book and never consulting the original author. What you end up with is a director/producer's version of the story, which may not be how the author intended.

Main contractor, subcontractors, subcontractors of the subcontractors, associated trades and service providers . . . who is conducting the complex building orchestra?

As the big fish in a little pond, main contractors can, and do, bid for tenders on the basis that if they win, they have the potential to apply pressure on their subcontractors to better their profit margin. In turn the subcontractor may squeeze his subcontractor to achieve a profit margin too. Eventually that profit margin does not exist and the little fish that gets the job will need to take a loss, or find a way of doing the job for the money offered. This system can, and does, lead to specification alterations on site, such as:

- **Product substitutions.** Individuals who are not qualified to make substitution choices are subjectively replacing specified products to make cost savings. A fire door is a fire door after all and an off-the-shelf one at half the cost of the specified one will do the job.
- **Short cuts being taken.** Time is money and if you can save on time by mechanically fixing dry



wall partitions at centres twice the required distance, you will have saved time and therefore money.

- **Lack of product knowledge.** What to use where and how individual products should be correctly installed in real situations is an area of real weakness; one that leads to convenient decisions being made rather than correct ones. When is it suitable to use an intumescent pillow and where should it sit in relation to the penetration? 'Ah . . . I'm not sure, just stick a pillow on the cable tray near the wall, it will do.'
- **Lack of competence.** At first glance, many jobs in the passive fire protection sector seem unskilled. Drilling a hole through a partition wall and sticking a pipe through is a general building job. The making good afterwards can, however, be the skilled bit. If fire stopping is done at all. 'If in doubt get the FR foam out,' seems to be the new site mantra.
- **Not doing the work at all is actually an option (but only rarely).** If the contractor thinks they can get away with it. Much of the passive fire protection within a building is hidden away and therefore it is possible to 'get away' without doing it properly. Particularly when no one from the main contractor is watching. Without that holistic responsibility for the build, the potential for things that should happen, not to happen, is certainly real. In reality, this only occurs on rare occasions.

### Shouldn't my New Building Come With an Instruction Book?

In England and Wales, Regulation 38 of the building regulations requires that: "The person carrying out the work shall give fire safety information to the responsible person not later than the date of completion of the work, or the date of occupation . . . whichever is earlier."

This information should ensure that, provided the building is constructed in accordance with the original design, the fire safety strategy given to the responsible person will be correct and it will accurately reflect the fire safety precautions within. Information such as: a copy of the building regulation fire drawings, details of compartmentation and cavity barriers, a copy of the fire strategy report, details of fire doors and escape routes, plus details of active alarm and detection, smoke extract or suppression systems should be handed to the building owner.

This information, however, is not always being passed on. And even if it was, the accuracy of the information could be far removed from what is actually 'built in' or not, as the case may be. This breakdown in information supply has a direct effect but also a knock-on effect. If building owners are unaware of what fire safety features are built into their property, is it any wonder that as buildings start to be used the original fire safety strategy is often compromised during refurbishment or upgrades by the owner.

### Everything is OK in the End Though; Building Control has Signed it Off

From start to finish, vital connections are not being made in the passive fire protection chain. This problem is not by any means limited to the UK. Thankfully, in Britain we have a building control regime to ensure buildings are fire safe.

Unfortunately even that system is being squeezed by financial constraints and through tight competition between Local Authority Building Control and Approved Inspectors where each is played off against the other. Seemingly the clients of the building control providers are unwilling to pay for more than the bare minimum of building control inspection.

Fire protection issues are being missed; there is



no doubt about that. It is, however, not through incompetence but the lack of an onsite presence. Which means, if no one is looking any more, buildings can get through to completion and handover without the fire protection being right.

### Can Future Fire Fatalities be Avoided?

In reality, not many people die in non-domestic fires in the UK or, indeed, in most well-structured countries. There are fires in schools, factories, offices and shops but very rarely do they claim lives.

When fire safety systems do fail in these buildings, the spread of fire and smoke does much more damage than the original design should allow and thus it costs more to repair or totally replace. One would therefore think that insurance companies would take more interest in fire protection being right in new builds and thus mitigating their losses.

And there is more evidence of tenders being influenced by insurance companies. A recent tender for a leisure centre in Scotland insisted on third-party certificated fire safety products being installed by third-party certificated installers of fire protection, making it comply with the policy of the building owners' insurance company. But there are many instances where this just is not being insisted upon.

- a** Provide and sign the certificates of compliance for the undertaking and completion.
- b** Co-ordinate the ancillary certification by members of the design team and other relevant bodies for the certificate of compliance completion.
- c** Identify all design professionals and specialists, in conjunction with the build; from whom certificates are required.
- d** Identify all certificates required and obtain them.
- e** Co-ordinate and collate all certification of compliance for completion in conjunction with the builder.
- f** In consultation with the members of the design team, shall plan and oversee the implementation of the inspection plan during construction.
- g** Provide the inspection plan, as set out in Section 7, and shall oversee adherence to this plan.
- h** On termination or relinquishment of their appointment, hand over to the building owner all certification prepared and inspection reports carried out.

*(Code of Practice for inspecting and certifying building works April 2013)*

**During our work as independent site inspectors, new build hospitals, care homes and purpose built blocks of apartments have been found to have serious issues with built-in passive fire protection. Some of the issues discovered were so severe that, if a fire had occurred during occupancy, the safety of those in the building would have been seriously at risk.**

Just as there is potential for increased financial loss in buildings, there is increased potential for multiple fatalities in certain high-risk buildings. Buildings that rely on passive fire safety systems for the escape strategy are being built with poor standards of passive fire protection and the potential for death or serious injury is real.

During our work as independent site inspectors, new build hospitals, care homes and purpose built blocks of apartments have been found to have serious issues with built-in passive fire protection. Some of the issues discovered were so severe that, if a fire had occurred during occupancy, the safety of those in the building would have been seriously at risk.

In order to reverse the trend here in the UK, connections have to be made to work through a mixture of cause and effect and through greater control. If some of the following ideas and concepts could be given the go-ahead, or become expected standards, then potential for fire deaths will be significantly reduced.

**1** The introduction of a dedicated 'certifier' for new builds in high risk properties. This would depend on competence and acceptance of liability. If one person could follow the building through from concept to completion, with detailed and appropriate inspection, things would be more likely to be done right. The Republic of Ireland is due to introduce a regime of approved certifiers into its building control. According to the last draft, these certifiers would:

- 1** In short, they would be the link from the idea to the delivery thus ensuring what is delivered is what was approved.
- 2** Introduce mandatory levels of building control inspections for high-risk properties that will confirm, through key stage sign-off, that all fire safety features have been installed correctly.
- 3** Introduce a 'fire safe register' that lists only third-party approved fire safety products and installers. By providing a single reference point for products that are fit for purpose and of competent installers, the chances of getting selection and installation of fire safety systems right is maximised.
- 4** The insurance industry should be encouraged to offer greater premium reductions to building owners that have the best provenance of fire safety system compliance.
- 5** Core fire safety awareness needs to be built into building and related trades training courses and qualifications. By focusing on fire and how it should be contained through passive fire protection, those in the trade that have competence can be the 'eyes' on site. This would hopefully spot bad practice and poor installations.

There should be no doubt that even in new builds the potential for fire tragedy is real. Passive fire protection is not meeting the basic requirements; it is not being installed 'right'. Getting it 'right' is the only quality indicator needed when a fire starts in a building.

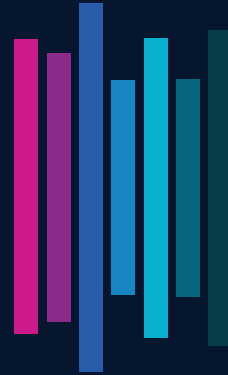
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**Simon Ince** is Strategic Alliance and Partnership Manager at Warrington Certification

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# Exhaust Ductwork Fire Protection

## Exhaust Ductwork Fire Protection in Timber Multi-family Structures.



**John Connors**

Unifrax

Dryers and washing machines were involved in one out of every 22 home structure fires reported to United States fire departments between 2006 and 2010. Thousands of dryer related blazes occur every year in US home structures as a result of these common appliances.

In commercial multi-family residences, dryer exhaust ductwork requires passive fire protection. Unfortunately, the prescribed fire protection features do not dovetail with the construction practices used in multi-family structures, leaving room for non-compliance and safety concerns. Although, the recent advent of tested and listed fire-resistance-rated dryer exhaust duct wraps has prompted new solutions that have reverberated through the industry, driving change.

### The Problem

How often is lint cleaned from dryer and exhaust ductwork? In 2010, there was an estimated reporting of 16,800 US home structure fires involving clothes dryers or washing units causing 51 deaths, 380 injuries and US\$236 million in property damage. In fact, clothes dryers alone accounted for 92 percent or nearly 15,460 of the fires in these home structures, defined as single family dwellings, duplexes, manufactured homes, apartments, town-



# EXHAUST DUCTWORK FIRE PROTECTION

houses, row-houses and condominiums.

While there are often multiple deficiencies culpable in fires, the root cause in approximately one-third of all residential dryer-related fires is simply a failure to properly clean and maintain the dryer unit and exhaust ductwork. This permits highly combustible lint and fibre to accumulate in the machine and ductwork.

Removing lint accumulation, one of the major sources of dryer fires, through simple, routine maintenance could likely prevent thousands of dryer-related fires every year. However, year after year fire statistics compiled over the past thirty years indicate consistent cleaning of the dryer and exhaust ductwork can become an afterthought in the hectic pace of everyday life. Regular cleaning and maintenance of dryer ductwork performed by tenants in afflicted residences, such as apartments and town-homes, may even be discouraged or frowned upon due to access or liability issues.

## Multifamily Construction Practices

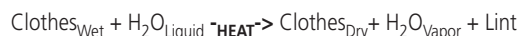
Timber is a lightweight, cost effective and energy efficient construction material. In fact, it is the only major renewable and sustainable building material. All of these characteristics make timber regularly used as the major structural component in the construction of low-rise apartments, townhouses, condominiums and residential units, also known as multi-family structures.

Timber-framed multi-family structures cover a vast spectrum of diverse residences, they can hold anywhere from two to 50 occupiable units, or more. They can be one-storey tall, or they can be upwards of four, depending on the construction type. These days, with consumer convenience paramount, particularly in competitive housing markets, it is quite common for residents to have their own personal washer and dryer located within their dwelling unit. In many instances, common laundry rooms have become a relic of college years past. Interestingly enough, the inclusion of dryers in these residences spurs both mechanical and somewhat ambiguous passive fire protection requirements, for routing dryer exhaust ventilation through the structure in a safe and effective manner.

Commercial structures, as a whole, have well-defined passive fire protection requirements, some of which are laid out in the International Building Code or jurisdiction-adopted alternative. One of the foremost fundamental and time tested notions of passive fire protection is compartmentation. Compartmentation is a building design feature that serves to inhibit the spread of fire and smoke from one unit to the rest of the structure for a given period of time, effectively providing life safety and property protection. Due to an ever present fire risk in any building, even structures utilising non-combustible framing materials, multi-family residential structures have fire-resistance requirements for all major building elements. For example, the 2012 International Building Code (IBC) dictates that timber-framed structures, three stories or under, must maintain one-hour fire-resistance-rated construction, partitioning, floors and tenant dwelling units. Rated construction functions to contain a potential fire to the unit of origin, permitting residents to safely exit the building while providing the fire department precious time to save the remainder of the structure.

## Typical Dryer Configurations

Cars need an exhaust system to emit the by-products generated from the combustion reaction of gasoline, in a similar sense, so do clothes dryers:



Clothes dryers must emit lint particles and hot, moisture-laden air generated during the drying process. Due to safety, mould and cleanliness concerns, these contents are required to be expelled outdoors. The 2012 International Mechanical Code (IMC) requires dryer systems in commercial multi-family residences to utilise 100mm galvanised steel or aluminium metallic ductwork of a specified thickness for the exhaust system. This is unlike the short runs of flexible ductwork many are accustomed to in single family dwellings.

Most dryer and washer units are large, loud and obtrusive. Not surprisingly, it is common for most residences, including multi-family units, to have a laundry room or dedicated space with specialised exhaust connections to store these machines. In multi-family residences these exhaust connections typically penetrate interior, non-rated walls within the unit where the dryer is being held. This is typically the same wall adjacent to the back of the dryer. From here, exhaust ductwork is routed upward in the wall stud cavity until it reaches the bottom membrane of an IBC prescribed one-hour fire-resistance-rated floor/ceiling assembly.

In order to exhaust outside, ductwork must penetrate through the ceiling membrane of the fire-resistance-rated floor assembly, turn 90 degrees, and route horizontally within the rated assembly. The ductwork runs in-between the supporting timber trusses or joists, depending upon the floor system, until the ductwork reaches its termination point, outside of the building. These construction techniques permit the dryer exhaust ductwork to be shrouded within the existing construction, without additional effort or cost.

The unique dryer exhausting strategy employed in rated timber construction results in a membrane penetration. A membrane penetration is simply defined as an opening made through one side of a wall, floor or ceiling assembly. In the common field scenario described, code-required passive fire protection requirements become necessary when the ductwork penetrates through the gypsum board membrane of the rated floor/ceiling assembly.

## The Code Requirements

Conventional practices in the design and construction of multi-family residences require dryer ductwork to penetrate and route through fire-resistance-rated assemblies. This clever design practice conceals ductwork from view at minimal cost and effort, but in the end, must still comply with code requirements. Membrane penetration protection is not explicitly stated in relation to dryer exhaust applications in the code. This coincides with ambiguity in compliance and enforcement. Even so, both the building and mechanical code have passive fire protection requirements to handle dryer exhaust ductwork.

Timber construction types employed in multi-family occupancies are required to have one-hour fire-resistance-rated construction by the International Building Code. This is specified in Table 601. Dryer exhaust ductwork that penetrates through a ceiling membrane of a rated assembly falls under

the guidance of IBC section 717.6.2 Membrane penetrations. Without restating the entire section, its intent in relation to dryer exhaust ductwork is straightforward. 717.6.2 states that fire protection is required in circumstances where ductwork penetrates through the ceiling membrane of fire-resistance-rated floor/ceiling construction. It also expresses the suitable means of protection, a shaft enclosure built around the ductwork. The section also offers some alternatives regarding dampers, but we will discuss that later.

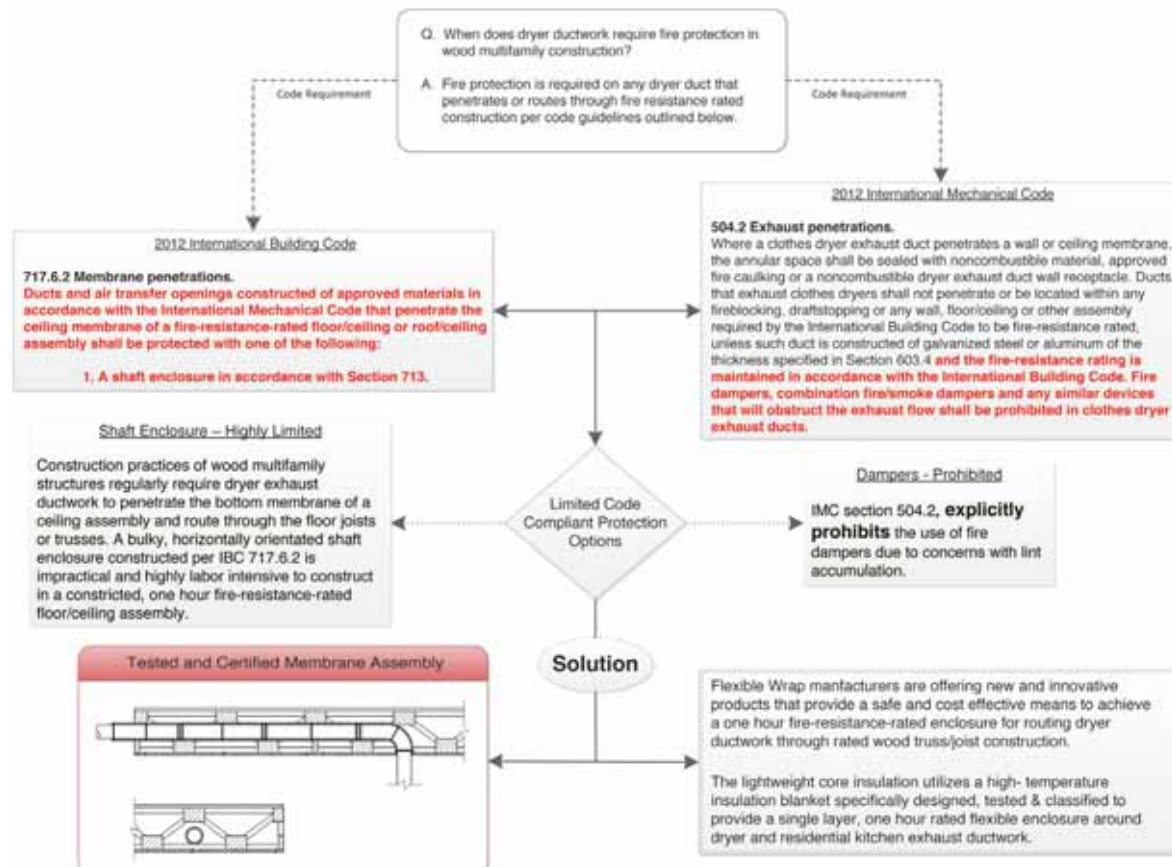
So what's a shaft? A shaft enclosure is a common passive fire protection feature for safely routing mechanical equipment, like grease ductwork for instance, through buildings. Shafts in timber construction comprise gypsum board and timber studs, usually the same construction as a fire-resistance-rated wall. They create a rated box or enclosure around the ductwork, acting under the principles of compartmentation. Shafts do function well in providing passive fire protection. Although, they utilise valuable building space and are not easy to construct in tight areas, around complex ductwork configurations, or in horizontal orientations. All of which, come into play in the construction of multi-family residences. The code in a typical multi-family dryer installation dictates a bulky, horizontally constructed shaft running through trusses.

Clearly, a shaft enclosure will not fit the bill for the vast majority of timber-framed multi-family structures. A shaft enclosure cannot be constructed due to the limited space constraints within the floor assemblies. Alternatively, aesthetic considerations and design functionality often bar the implementation of an interior shaft or soffit, which would create a protrusion running through the

occupancy. The only other alternative available is to route the exhaust ductwork outside the building, an option not commonly exercised in the field.

With shaft protection limited, a damper may appear to be an attractive code-compliant resolution. Unfortunately, this is not the case. The International Mechanical Code in section 504.2 Exhaust penetrations explicitly prohibits the use of fire dampers. The rationale behind this relates back to the major root cause of dryer fires, lint accumulation. In-line dampers have the potential to trap and allow lint to accumulate in the duct, creating a blatant fire hazard. This is why the mechanical code also prohibits any protrusions within dryer exhaust ductwork. Further on in section 504.2, the IMC goes on to reinforce the International Building Code shaft protection rationale stated in IBC section 717.6.2. Section 504.2 reaffirms dryer exhaust ductwork that penetrates a fire-resistance-rated assembly must maintain the rating of the assembly in accordance with the IBC; that is, a shaft enclosure.

It is clear the present industry construction guidelines do not address a realistic and attainable means of dryer duct fire protection in line with the construction practices used in multi-family residences. This leaves designers and installers at a cross-road. Without a simple, clear-cut solution the easiest answer at worst may leave penetrations unsealed and ductwork unprotected. Left unprotected, dryer penetrations result in untested membrane penetrations that compromise the designed fire-resistance-rating of the assembly. Additionally, there are valid concerns routing exposed ductwork, up to 25 ft., in close or direct contact with the combustible joists or trusses of the floor structure. See the code flowchart below.





ensures the integrity of the fire-resistance-rating on the floor assembly. This coverage can only be achieved by testing actual insulated ductwork routed through a one-hour-rated floor assembly, as would be done in practice.

Membrane penetration systems are evaluated in multiple respects under standardised fire conditions:

- 1 Insulation** – System must meet criteria which limits the temperature rise of the insulated ductwork.
- 2 Integrity & Stability** – System must ensure ductwork remains intact and in place.
- 3 Penetration** – System must have a penetration seal that remains intact with no flaming over the entire duration of the fire exposure; must also pass a hose stream test.

### Duct Wraps, a Novel Solution

Fortunately, flexible duct wrap manufacturers have recognised the disparity between the current code language, traditional passive fire protection options, and multi-family building practices. In fact, this predicament is how duct wraps for other now popular applications came to fruition. Duct wraps acting as flexible, rated enclosures continue to solve field complications shaft construction cannot address. Flexible duct wraps are widely utilised as shaft enclosure alternatives in common applications such as commercial kitchen exhausts, air handling ductwork, chemical fume ductwork and others. They are recognised to create tangible value, saving customers money, installation time, and building space.

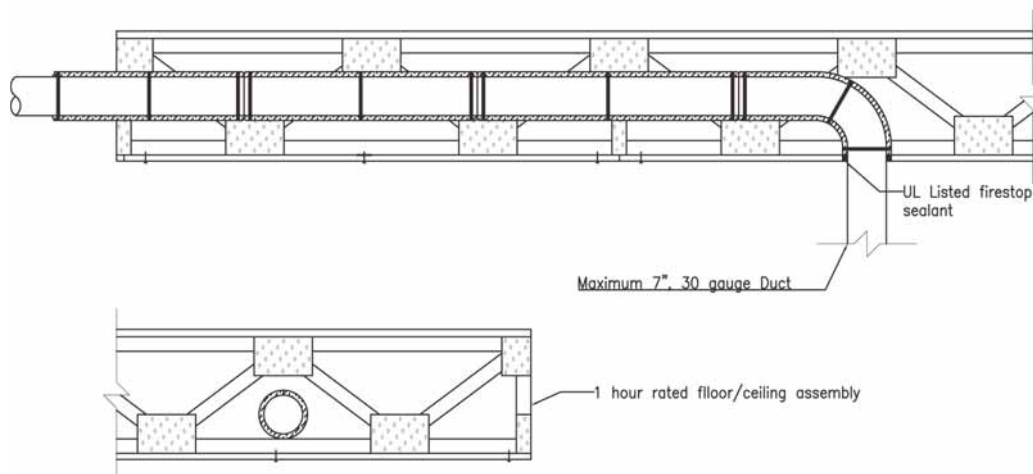
To address dryer exhaust fire protection, some duct wrap manufacturers have developed tested systems in conjunction with nationally recognised testing laboratories, like Underwriter's Laboratory, that reproduce common installation configurations. One such configuration is a dryer exhaust membrane penetration, which can be found online in the UL directory under the category name, XHEZ. A membrane penetration system provides a unique, application specific, fire-resistance-rating for both the ductwork and penetration. It also

- 4 Floor Assembly** – System must ensure the one-hour fire-resistance-rating of the floor assembly is unaffected.

Duct wrap systems provide a simple, yet effective way to enclose and provide separation between the ductwork and existing rated construction, permitting a true drop-in-place solution.

Tested membrane penetration assemblies in conjunction with relevant duct testing provides customers and code officials assurance that duct wrap products have been evaluated to industry-standard fire exposures. They also ensure routing dryer ductwork through the floor cavity has no detrimental impact to the designed rating of the floor. Dryer duct wrap products offered by manufacturers are also tailored specifically for dryer exhaust applications. Wrap manufacturers offer specialised thicknesses and material widths that reduce the amount of material scrap and offcuts for a simple, no-frills installation. All in all, flexible, field applied shaft alternatives are lightweight, thin and support installer friendly systems, but most importantly promote code compliant solutions that can take the heat.

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**John Connors** is an  
Application Engineer –  
Fire Protection at Unifrax

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FyreWrap® DPS Insulation just opened the door to improved dryer duct fire protection.



Recent NFPA statistics indicate significant injuries, loss of life and property damage due to clothes dryer fires in residential buildings. At the same time, code requirements for dryer exhaust ductwork in multi-family residences have been difficult to achieve in real-world conditions – until now.

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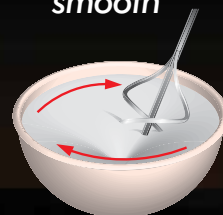


## ▶ Easy Preparation & Application...

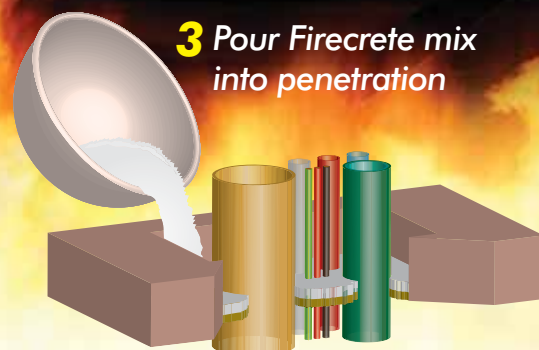
**1** Add Firecrete powder to water



**2** Mix until smooth



**3** Pour Firecrete mix into penetration



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# Hydrocarbon Fire Protection for Structural Steel



**Sean Appleton**

3M Oil & Gas

Fire is a terrible and ever present danger for hydrocarbon processing facilities, capable of inflicting huge social, political, financial, and ecological devastation. The 2012 fire and blast at Venezuela's Amuay refinery killing 48 people and causing an estimated US\$1.7 billion of damage, is just one of dozens of reported fires that occur annually at refineries around the world.

**M**any blame these incidents on cost-cutting and lack of preventative maintenance of safety critical systems. All involved in protecting these facilities have a duty of care to help mitigate against such disasters by reducing the potential for fire to acceptable levels.

### Hydrocarbon & Jet Fire

The two most common types of fire that are likely to occur at a hydrocarbon processing facility are hydrocarbon and jet fire. Hydrocarbon or 'pool' fires occur when a flammable liquid leaks from a vessel or pipeline to form a reservoir, which then ignites. A hydrocarbon fire will generate temperatures of up to 1100°C within ten minutes of ignition and create heat fluxes of around 150-200 kW/m<sup>2</sup>.

A jet fire usually involves a forceful flame, created by highly combustible fuel that is released in a particular direction as a result of a rupture to a pressurised vessel or gas line. This situation can create particularly intense levels of localised heat,

plus exaggerated degrees of heat flux and turbulence, and it is far more capable of eroding fire protection measures, damaging structural steelwork and rupturing other vessels and pipework than a non-hydrocarbon blaze.

### Structural Steel Protection

Petrochemical facilities often include major structural components made from steel including structural steel columns and beams, steel pipe-racks and steel supports for storage vessels containing flammable, combustible or toxic liquids.

Steel is a material often viewed as being less prone to the damaging effects of fire due to its rigidity and strength, with the ability to withstand whatever comes its way. Unfortunately this is not always the case. When exposed to temperature rises, steel can begin to lose its strength with alarming speed, particularly when under duress from hydrocarbon and jet fires. Passive fire protection measures slow the rate of heat transfer into the steel structure and significantly delay the time



### Case Study: US Gulf Coast Refinery

More than 15 years ago, a large oil and gas refinery on the US Gulf Coast installed 3M E-mat to protect structural steel. The material was applied to protect the vessel skirts and two-story tall steel legs that support many large spherical tanks containing flammable petroleum distillates in the refinery.

Two layers of 3M E-mat were wrapped around the approximately 61-centimetre-wide legs and held in place with stainless steel banding. Although not required, a stainless steel jacket was then applied on top of the 3M E-mat to protect the material from rain, salt in the humid air, dust, and ultraviolet light in sunlight.

An engineer at the refinery recently contacted 3M and requested assistance in identifying the 3M material. At the time, the plant was conducting a periodic inspection of the structural steel in various areas of the refinery to determine if corrosion beneath the 3M E-mat was occurring. "It only took a moment to identify the 3M Interam Endothermic Mat. The 3M product was well protected by the stainless steel jacket and looked like it was new. There was no deterioration at all," said Matthew Aguirre, Sales Representative, 3M Building & Commercial Services / Fire Protection Products. "The structural steel also looked great and showed no sign of rust or corrosion."

The non-destructive inspection and testing for corrosion and compliance was performed quickly, and the 3M E-mat that had been removed without being damaged was simply reinstalled. A few damaged pieces that occurred during inspection needed to be replaced. "Refinery officials were very pleased with the inspection results and they were surprised by the longevity of 3M E-mat," said Aguirre. "The material does not dry out so maintenance is effortless. It also allows easy inspection. Just cut a piece to inspect the structural steel, then foil tape it back into place and add the stainless steel band. It's that easy."

it takes to reach the point where structural failure occurs. This allows more precious time to evacuate personnel, activate emergency shut-down valves (ESDVs) and bring a fire under control, helping to limit the destructive effects of a major blaze.

Traditional methods for protection of structural steel elements include cementitious sprays and intumescent coatings that are applied to the surface of the steel element providing a permanent barrier. Increasingly those responsible for designing and maintaining petrochemical facilities are seeking more flexible solutions that allow ease of upgrade, maintenance, and periodic inspection for damage and degradation, including corrosion under insulation.

#### Corrosion under Insulation (CUI)

Corrosion under insulation (CUI) is a severe form of localised corrosion that occurs in carbon and low alloy steel equipment that has been insulated. CUI occurs when water is absorbed by the insulation and, over time, the equipment begins to

corrode as it is exposed to water and oxygen. CUI is particularly common in refineries and process plants that operate equipment at high temperatures.

Research suggests that CUI is responsible for the highest incidence of leaks in refineries and chemical facilities and costs the industry tens of millions of dollars a year in repair and maintenance costs.

CUI is often difficult to detect on steel that has been fireproofed with cementitious spray or intumescent coatings because the insulation hides the corrosion problem until it is too late. Inspecting for corrosion under coated fireproof insulation usually requires cutting small sections in the coating surface and carrying out ultrasonic testing. If corrosion is ultimately discovered, the entire coating system must be removed and replaced. This whole process is expensive, time consuming and disruptive to ongoing operations. Subsequently, inspections for corrosion under insulation are not completed regularly enough often resulting in tragic consequences.

#### Endothermic Technology

Flexible materials using endothermic technology release chemically bound water to slow heat transfer when exposed to high temperatures or flame and can protect structural steel components from hydrocarbon fire for up to four hours. Unlike fireproof coating systems, endothermic mats can be easily removed and re-applied for routine corrosion inspections, maintenance, or repairs.

This sheet material has a bonded aluminium foil outer layer and is both flexible and tough enough to be wrapped around a wide variety of potentially exposed vulnerable equipment. 3M Interam Endothermic Mat (or '3M E-mat'), for example, incorporates endothermic technology and has been proven to provide outstanding performance for a range of fire scenarios including large hydrocarbon pool fires in accordance with UL 1709 (ASTM E 1529).

3M E-mat wraps around structural steel elements and is held in place by stainless steel strapping, with aluminium foil tape and fire-proofing sealant used to cover gaps, seams and termination points. In most circumstance, little or no preparation to the steel substrate is required. E-mat can also be applied directly over existing cement or block where upgrade in fire protection is required. 3M E-mat does not encourage corrosion and can be installed with or without a stainless steel jacket, which helps preserve the system in extremely harsh conditions. The material satisfies UL 1709 environmental test standards both with and without the stainless steel jacketing.

#### Conclusion

CUI is a common problem shared by hydrocarbon and gas processing facilities around the world. CUI is difficult to detect because it is often hidden by a fireproof coating that masks the corrosion problem until it is too late. Flexible and re-enterable endothermic wrap systems such as 3M E-mat offer many functional and economic benefits to asset owners.

3M E-Mat has been used extensively around the world for over 30 years and is ideal for effective fire safety solutions for both offshore and onshore energy environments..

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Sean Appleton is Marketing Manager at 3M Oil & Gas

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# Inspection, Testing & Building Fire Risk

*Pic courtesy of  
Graham Collins*



Most, if not all of the codes and standards governing the installation and maintenance of fire protection systems in buildings include requirements for inspection, testing, and maintenance activities to verify proper system operation on-demand. As a result, most fire protection systems are routinely subjected to these activities. For example, NFPA 251 provides specific recommendations of inspection, testing, and maintenance schedules and procedures for sprinkler systems, standpipe and hose systems, private fire service mains, fire pumps, water storage tanks, valves, among others. The scope of the standard also includes impairment handling and reporting, an essential element in fire risk applications.

**Francisco Joglar**

Hughes Associates

Given the requirements for inspection, testing, and maintenance, it can be qualitatively argued that such activities not only have a positive impact on building fire risk, but also help maintain building fire risk at acceptable levels. However, a qualitative argument is often not enough to provide fire protection professionals with the flexibility to manage inspection, testing, and maintenance activities on a performance-based/risk-informed approach. The ability to explicitly

incorporate these activities into a fire risk model, taking advantage of the existing data infrastructure based on current requirements for documenting impairment, provides a quantitative approach for managing fire protection systems.

This article describes how inspection, testing, and maintenance of fire protection can be incorporated into a building fire risk model so that such activities can be managed on a performance-based approach in specific applications.



# g & Maintenance k

## Risk & Fire Risk

“Risk” and “fire risk” can be defined as follows:

- Risk is the potential for realisation of unwanted adverse consequences, considering scenarios and their associated frequencies or probabilities and associated consequences.
- Fire risk is a quantitative measure of fire or explosion incident loss potential in terms of both the event likelihood and aggregate consequences.

Based on these two definitions, “fire risk” is defined, for the purpose of this article as quantitative measure of the potential for realisation of unwanted fire consequences. This definition is practical because as a quantitative measure, fire risk has units and results from a model formulated for specific applications. From that perspective, fire risk should be treated no differently than the output from any other physical models that are routinely used in engineering applications: it is a value produced from a model based on input parameters reflecting the scenario conditions. Generally, the risk model is formulated as:

$$\text{Risk}_i = \sum \text{Loss}_i \times F_i$$

Where:  $\text{Risk}_i$  = Risk associated with scenario  $i$   
 $\text{Loss}_i$  = Loss associated with scenario  $i$   
 $F_i$  = Frequency of scenario  $i$  occurring

That is, a risk value is the summation of the frequency and consequences of all identified scenarios. In the specific case of fire analysis,  $F$  and  $\text{Loss}$  are the frequencies and consequences of fire scenarios. Clearly, the unit multiplication of the frequency and consequence terms must result in risk units that are relevant to the specific application and can be used to make risk-informed/performance-based decisions.

cigarette-induced household fires per year, etc.

- **Location:** The location of the fire scenario refers to the characteristics of the room, building or facility in which the scenario is postulated. In general, room characteristics include size, ventilation conditions, boundary materials, and any additional information necessary for location description.
- **Ignition source:** This is often the starting point for selecting and describing a fire scenario; that is, the first item ignited. In some applications, a fire frequency is directly associated to ignition sources.
- **Intervening combustibles:** These are combustibles involved in a fire scenario other than the first item ignited. Many fire events become “significant” because of secondary combustibles; that is, the fire is capable of propagating beyond the ignition source.
- **Fire protection features:** Fire protection features are the barriers set in place and are intended to limit the consequences of fire scenarios to the lowest possible levels. Fire protection features may include active (for example, automatic detection or suppression) and passive (for instance; fire walls) systems. In addition, they can include “manual” features such as a fire brigade or fire department, fire watch activities, etc.
- **Consequences:** Scenario consequences should capture the outcome of the fire event. Consequences should be measured in terms of their relevance to the decision making process, consistent with the frequency term in the risk equation.

Although the frequency and consequence terms are the only two in the risk equation, all fire scenario characteristics listed previously should be

**Fire risk” is defined, for the purpose of this article, as quantitative measure of the potential for realisation of unwanted fire consequences.**

**This definition is practical because as a quantitative measure, fire risk has units and results from a model formulated for specific applications.**

The fire scenarios are the individual units characterising the fire risk of a given application. Consequently, the process of selecting the appropriate scenarios is an essential element of determining fire risk. A fire scenario must include all aspects of a fire event. This includes conditions leading to ignition and propagation up to extinction or suppression by different available means. Specifically, one must define fire scenarios considering the following elements:

- **Frequency:** The frequency captures how often the scenario is expected to occur. It is usually represented as events/unit of time. Frequency examples may include number of pump fires a year in an industrial facility; number of

captured quantitatively so that the model has enough resolution to become a decision-making tool.

The sprinkler system in a given building can be used as an example. The failure of this system on-demand (that is; in response to a fire event) may be incorporated into the risk equation as the conditional probability of sprinkler system failure in response to a fire. Multiplying this probability by the ignition frequency term in the risk equation results in the frequency of fire events where the sprinkler system fails on demand.

Introducing this probability term in the risk equation provides an explicit parameter to measure the effects of inspection, testing, and

maintenance in the fire risk metric of a facility. This simple conceptual example stresses the importance of defining fire risk and the parameters in the risk equation so that they not only appropriately characterise the facility being analysed, but also have sufficient resolution to make risk-informed decisions while managing fire protection for the facility.

Introducing parameters into the risk equation must account for potential dependencies resulting in a mis-characterisation of the risk. In the conceptual example described earlier, introducing the failure probability on-demand of the sprinkler system requires the frequency term to include fires that were suppressed with sprinklers. The intent is

Such a frequency will have at least two outcomes. The first sequence would consist of a fire event where the suppression system is successful. This is represented by the frequency term multiplied by the probability of successful system operation and a consequence term consistent with the scenario outcome. The second sequence would consist of a fire event where the suppression system failed. This is represented by the multiplication of the frequency times the failure probability of the suppression system and consequences consistent with this scenario condition (that is; higher consequences than in the sequence where the suppression was successful).

**Maintenance activities can be preventive or corrective. "Preventive maintenance" refers to actions taken to retain an item at a specified level of performance. "Corrective maintenance" represents actions taken to restore a system to an operational state after it is disabled due to a failure or impairment.**

to avoid having the effects of the suppression system reflected twice in the analysis, that is; by a lower frequency by excluding fires that were controlled by the automatic suppression system, and by the multiplication of the failure probability.

## Maintainability & Availability

In repairable systems, which are those where the repair time is not negligible (that is; long relative to the operational time), downtimes should be properly characterised. The term "downtime" refers to the periods of time when a system is not operating. "Maintainability" refers to the probabilistic characterisation of such downtimes, which are an important factor in availability calculations. It includes the inspections, testing, and maintenance activities to which an item is subjected.

Maintenance activities generating some of the downtimes can be preventive or corrective. "Preventive maintenance" refers to actions taken to retain an item at a specified level of performance. It has potential to reduce the system's failure rate. In the case of fire protection systems, the goal is to detect most failures during testing and maintenance activities and not when the fire protection systems are required to actuate. "Corrective maintenance" represents actions taken to restore a system to an operational state after it is disabled due to a failure or impairment.

In the risk equation, lower system failure rates characterising fire protection features may be reflected in various ways depending on the parameters included in the risk model. Examples include:

- A lower system failure rate may be reflected in the frequency term if it is based on the number of fires where the suppression system has failed. That is, the number of fire events counted over the corresponding period of time would include only those where the applicable suppression system failed, leading to "higher" consequences.
- A more rigorous risk-modelling approach would include a frequency term reflecting both fires where the suppression system failed and those where the suppression system was successful.

Under the latter approach, the risk model explicitly includes the fire protection system in the analysis, providing increased modelling capabilities and the ability of monitoring the performance of the system and its impact on fire risk.

The probability of a fire protection system failure on-demand reflects the effects of inspection, maintenance, and testing of fire protection features, which influences the availability of the system. In general, the term "availability" is defined as the probability that an item will be operational at a given time. The complement of the availability is termed "unavailability," where  $U = 1 - A$ . A simple mathematical expression capturing this definition is:

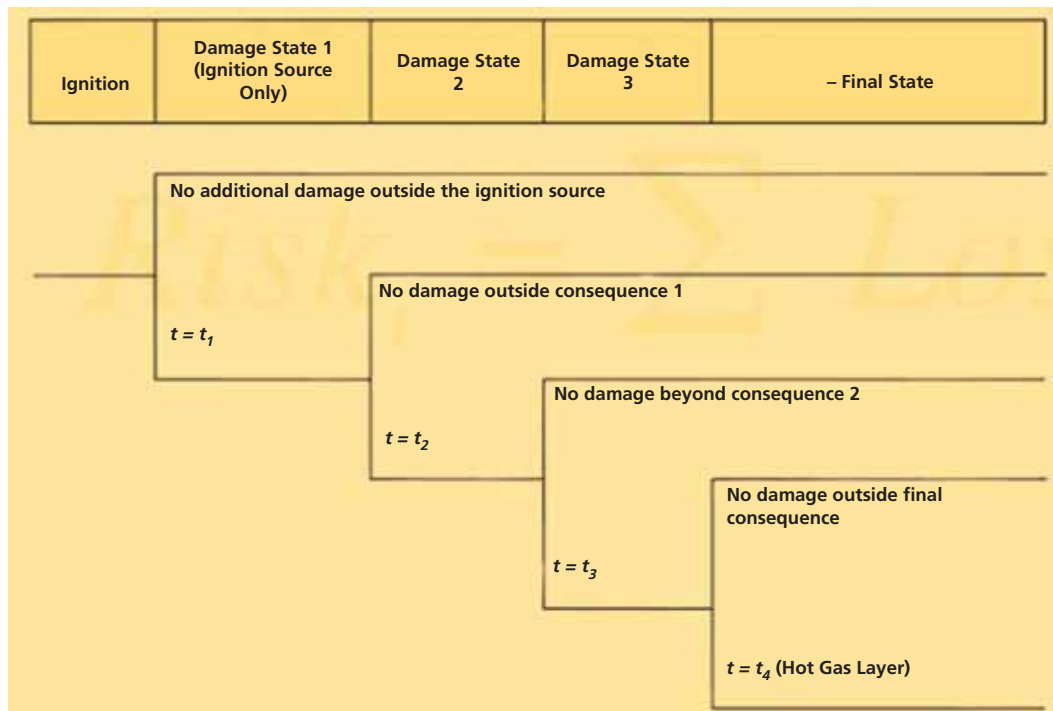
$$A = \frac{u}{u+d}, \quad U = \frac{d}{u+d} = 1-A$$

where  $u$  is the uptime, and  $d$  is the downtime during a predefined period of time (that is; the mission time).

In order to accurately characterise the system's availability, the quantification of equipment downtime is necessary, which can be quantified using maintainability techniques, that is; based on the inspection, testing, and maintenance activities associated with the system and the random failure history of the system.

An example would be an electrical equipment room protected with a CO<sub>2</sub> system. For life safety reasons, the system may be taken out of service for some periods of time. The system may also be out for maintenance, or not operating due to impairment. Clearly, the probability of the system being available on-demand is affected by the time it is out of service. It is in the availability calculations where the impairment handling and reporting requirements of codes and standards is explicitly incorporated in the fire risk equation.

As a first step in determining how the inspection, testing, maintenance, and random failures of a given system affect fire risk, a model for determining the system's unavailability is necessary. In



*Example of a Fire Scenario Progression Event Tree)*

practical applications, these models are based on performance data generated over time from maintenance, inspection, and testing activities. Once explicitly modelled, a decision can be made based on managing maintenance activities with the goal of maintaining or improving fire risk. Examples include:

- Performance data may suggest key system failure modes that could be identified in time with increased inspections (or completely corrected by design changes) preventing system failures or unnecessary testing.
- Time between inspections, testing, and maintenance activities may be increased without affecting the system unavailability.

These examples stress the need for an availability model based on performance data. As a modelling alternative, Markov models offer a powerful approach for determining and monitoring systems availability based on inspection, testing, maintenance, and random failure history. Once the system unavailability term is defined, it can be explicitly incorporated in the risk model as described in the following section.

### Effects of Inspection, Testing, & Maintenance in the Fire Risk

The risk model can be expanded as follows:

$$\text{Risk}_i = \sum U \times \text{Loss}_i \times F_i$$

where  $U$  is the unavailability of a fire protection system. Under this risk model,  $F$  may represent the frequency of a fire scenario in a given facility regardless of how it was detected or suppressed. The parameter  $U$  is the probability that the fire protection features fail on-demand. In this example, the multiplication of the frequency times the unavailability results in the frequency of fires where fire protection features failed to detect and/or control the fire. Therefore, by multiplying the scenario frequency by the unavailability of the fire protection feature, the frequency term is

reduced to characterise fires where fire protection features fail and, therefore, produce the postulated scenarios.

In practice, the unavailability term is a function of time in a fire scenario progression. It is often set to 1.0 (the system is not available) if the system will not operate in time (that is; the postulated damage in the scenario occurs before the system can actuate). If the system is expected to operate in time,  $U$  is set to the system's unavailability.

In order to comprehensively include the unavailability into a fire scenario analysis, the following scenario progression event tree model can be used. Figure 1 illustrates a sample event tree. The progression of damage states is initiated by a postulated fire involving an ignition source. Each damage state is defined by a time in the progression of a fire event and a consequence within that time.

Under this formulation, each damage state is a different scenario outcome characterised by the suppression probability at each point in time. As the fire scenario progresses in time, the consequence term is expected to be higher. Specifically, the first damage state usually consists of damage to the ignition source itself. This first scenario could represent a fire that is promptly detected and suppressed. If such early detection and suppression efforts fail, a different scenario outcome is generated with a higher consequence term.

Depending on the characteristics and configuration of the scenario, the last damage state may consist of flashover conditions, propagation to adjacent rooms or buildings, etc. The damage states characterising each scenario sequence are quantified in the event tree by failure to suppress, which is governed by the suppression system unavailability at pre-defined points in time and its ability to operate in time.

IFP

This article originally appeared in Fire Protection Engineering magazine, a publication of the Society of Fire Protection Engineers ([www.sfpe.org](http://www.sfpe.org)).

**Francisco Joglar** is a fire protection engineer at Hughes Associates

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# Hazardous Area Gas Detection

Protecting personnel, assets and the environment are the highest priorities for manufacturing and industrial plants the world over, from chemical and petrochemical facilities to water and wastewater treatment sites.



**Kevin Honner**

Dräger

In a hazardous environment, reliable gas detection solutions can mean the difference between a fire or explosion spreading beyond all control. An early form of detection that minimises the risk of disastrous consequences and triggers a response could prove to be lifesaving.

For many people working in an industrial environment, dealing with hazardous and potentially deadly substances is all part of the day job. It is a given that you have to plan for, protect against and even brave hazards from potentially explosive atmospheres to chemical spills, which can readily burn or explode. Explosive atmospheres can be caused by flammable gases, mists or vapours or by combustible dusts. The problem with gases is that they often do not behave as we would expect, so having a robust gas detection system in place is vital.

In industries where a myriad of different fire hazards are present, minimising risk so that important day-to-day jobs can continue as normal should be a central part of a company's safety solutions. Gas detection is the first step to ensure worker safety and can act as an early warning, but there are many key components to optimise these solutions, thus maximising the safety and protection afforded by reliable gas detection. To ensure optimal performance, the type of detection method has to be chosen carefully to match the type of gases present and prevent false alarms.

## Explosion Protection & Plant Safety

In almost every individual application, flammable substances are used and gas detection systems must become reliable protection systems. Wherever there are hazardous situations due to the presence of combustible gases and vapours – for example, in processes involving the use of solvents or in the plastics processing industry – explosion protection measures must be in place as regulated by law, to ensure personnel and plant safety. These systems are designed to trigger an alarm in sufficient time to inform the operator and perform counter measures for the prevention of a potentially explosive scenario. The safety concept of a gas detection system always follows this protocol; detect dangerous gas, react and avert.

It is hard to believe, but even oxygen, the very elixir of life, can be a potentially dangerous fire hazard. It behaves very differently to air, compressed air, nitrogen and other inert gases and is very reactive. Even a small increase in oxygen levels in the air can provide the conditions for fire to spread much quicker and burn more fiercely. Depending on the application, different measuring principles for the detection of flammable gas and vapours can be used – for example, catalytic bead sensors, point or open-path infrared sensors and the system should be tailored to the individual needs of the operator. When combined with a central controller, it is possible to detect flammable



vapours and gases such as hydrocarbons and hydrogen at an early stage, where concentrations are so low that a dangerous condition or risk of explosion can be reliably averted.

### Identifying Risks

Before deciding on the appropriate measure of gas detection, which undoubtedly will be a bespoke solution for every organisation, it is important to get back to basics and identify the gas detection system that will support your workforce's safety goals. Considering the following points is an important means by which to identify the risks and determine the most appropriate means of gas detection and can be applied to any situation:

- What potential worksite hazards exist?
- What alarm time is most appropriate given the hazards present?
- Does the project require portable or fixed gas detection?
- What environmental conditions must the system withstand?
- How do my employees work best and what type of system will allow for ease of use?
- Do we need to look at a single worksite or multiple locations?
- What training will be most effective for my employees?

Wherever toxic or flammable chemicals are being manufactured, processed, stored or shipped, there will always be a risk of an accident or substance release. Even the smallest release of substances can cause harm to people, damage the environment or even destroy property. Essentially, any gas is potentially dangerous, whether liquefied, compressed or in a normal state.

There are three categories of risk that must be detected reliably in order to protect human life, assets and the environment.

- Ex – risk of explosion by flammable gases.
- Ox – oxygen; risk of asphyxiation by oxygen displacement or risk of increase of flammability by oxygen enrichment.
- Tox – risk of poisoning by toxic gases.

Without auxiliary tools, people are often unable to recognise these dangers early enough to initiate appropriate counter measures. In a chemical plant for example, where there are a myriad of hazards

presenting themselves at any one time, managing risk and having in place substantial gas detection systems plays a major role in the mitigation or prevention of a major accident or incident.

It is the responsibility of any company operating in a hazardous area to carry out the appropriate risk assessment depending on the probability of the occurrence of toxic or explosive incidents. Certain areas present a higher risk probability, yet if such locations are not easily identifiable it is important to distribute gas detection sensors across the entire hazardous area to help to manage the risk.

It follows that the necessary steps should be put in place and the most appropriate gas detection methods employed, to ensure workers are alerted to harmful gases if the situation arises and human lives, as well as industrial facilities, are protected.

### Sniffing-out Gases

Our sensory organs are often unable to detect airborne hazards or cannot do so early enough. Toxic or flammable gases and vapours can build up reaching hazardous concentrations, or there may be insufficient oxygen in the air, which can result in a life-threatening situation. A detection system must respond reliably to a variety of gases, identify them and measure their concentration in the ambient air. Any such system needs to be meticulously planned and carefully considered before being implemented.

When it comes to gas-related accidents, most eventualities do not 'just happen'. Each of these accidents is more often than not, a culmination of a series of individually minor events that combine and add up to cause a more serious problem. The detection of even the smallest gas leak for example, can avert a chain reaction that would otherwise take on a life of its own and even threaten lives. These leaks can arise when cold, liquefied and other pressurised gases are released into the ambient air and mix with it. Their concentration decreases and the gas dispersion depends more on the current temperature conditions and ambient air convection than on the density of pure gas.

Usually invisible to the naked eye, often odourless and impossible to hear, many substances are undetectable to the human senses – but leaks of these gases and vapours can pose a very



dangerous threat to both people and places. Depending on their substance, quantity and location, gas leaks can cause everything from immediate ill health to plant shutdowns and potentially explosive situations.

Critical points where the release of gases could occur include all types of storage vessels, including valves and pipes, as well as in machinery and pumps. Dynamic loading as a result of temperature and pressure variations, corrosion and material fatigue are important factors that may lead to leakage from joints and seals and filling and tapping points also need special attention. There is also the issue of technical leakage to consider, whereby material is deliberately released through valves, diaphragms and overflows to prevent malfunction. The most notable incidents are those in which dangerous substances are released. In this form of release, gases form a cloud around the leakage point and the edge of the cloud becomes a turbulent boundary zone.

As well as differences in gas behaviour, there are also differences between gas detection in confined spaces and in the open air. The conditions for the formation of gas clouds in interior spaces are similar to those in the open air but gas clouds behave very differently in an enclosed space. In cases like these, the architecture, convective flows and ventilation determines the spread of the gas. Pools of heavy vapours are especially dangerous as they can form on the floors of enclosed spaces such as cellars and tanks.

## The Role of Gas Detection Systems

Gas detection systems are fundamentally products of safety technology, used to protect workers and ensure plant safety. It is important not to misinterpret the role such a system. They are not simply a handful of detectors spread across an industrial plant; rather they should be considered a bespoke solution developed to meet individual protection objectives.

Gas detection systems can be portable gas measuring instruments or fixed installed gas detection systems. The safety of an area potentially being affected by dangerous gases and vapours to a high degree depends on the reliability of the gas detection system and the quality of the sensors being used. We often find that fixed installed systems are in operation continuously, 24 hours a day, year after year, to ensure that they are alerted under any instance of a random gas release, as well as operating under extreme environmental conditions.

Past events show that fires can spread rapidly causing devastating consequences to industrial plants and surrounding areas.

## So, How Do We Protect Against Gases Behaving Unpredictably?

Many toxic and flammable gases are very reactive and under suitable conditions they can change by chemical reactions. Modern gas detection systems utilise a multitude of techniques in their operations; from electrochemical sensors and catalytic bead sensors to infrared technology in point sensors and open path sensors, as well as flame detectors, ultrasonic sensors and gas cameras. Just as gases can display unusual characteristics, the real innovation in gas detection technology is in the very precise matching of the measuring



system to localised circumstances and particular requirements.

With ever-improving sensors, modern detection technology for flammable and hazardous gases enables us to design highly reliable gas detection systems. The foundation for planning any system is well-considered matching of the components, based on a range of different technologies, to specific local conditions.

## Holistic Solutions

Safety needs cannot be met by 'off-the-peg' solutions and it is important to undertake a detailed analysis of the current situation to ensure that all individual needs in gas detection are met, providing an holistic solution.

Significantly, no one detection system can work in isolation, hence the role of bespoke solutions and the importance of tailoring a company's safety systems to its individual needs. Gas detection systems can be supported effectively by explosion-proof and reliable flame detection systems. It is important to have in place a full and tailored solution according to your needs and driven by the application including substance, surrounding environment and processes, fire type (hydrocarbon or non-hydrocarbon) and size.

To ensure that a gas detection system is able to react quickly and precisely, its components must be carefully matched to the particular circumstances such as the physical and chemical properties of the materials, assumption of the most likely leakage points, as well as the location's constructional, geographical and meteorological conditions.

The prediction of gas dispersion and most likely behaviour, based on particular circumstances, forms the basis for a gas detection system, whether stationary or mobile. Fundamentally, in order to ensure a system's reliability, it must be correctly installed, calibrated, operated and maintained. It follows that within every tailored gas detection system should come a bespoke training and servicing plan, an area which Dräger believes is absolutely imperative in ensuring the safety of human lives.

Making sure there is a robust system in place could mean the difference between life and serious injury or even death.

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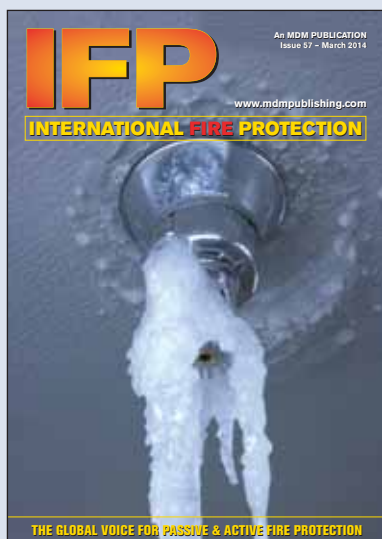
Kevin Honner is a gas detection expert at Dräger

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The Abbey Manor Business Centre, The Abbey,  
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**Publishers**  
Mark Seton & David Staddon

**Group Editor**  
Graham Collins

**Editorial Contributors**  
Graham Collins, Suzanne Donovan, Bob Glendenning, Chris Miles, Dave Pelton, Mark L. Robin, Ron Marcus, James Ivanovski, Julian Bailey, Martin McGettrick, Tim Checketts, Niall Rowan

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**Graham Collins**

Email: [graham.collins@mdmpublishing.com](mailto:graham.collins@mdmpublishing.com)

# Look, Listen & Learn

Once again we seem to be in “exhibition season” around the world. While the numbers of visitors will hopefully break previous attendance figures, I suspect I may again be left wondering if more people should have attended and whether some in the industry really realises the full potential that these events offer.

It is very easy to fall into the trap of considering exhibitions to be little more than an opportunity for commercial companies to sell their products. Sure, the exhibitor's game plan is about generating business – and good luck to them – but exhibitions are also unique opportunities for visitors to learn more about how technology is developing, how old challenges are being overcome, and what better solutions may exist than the ones currently being adopted. In fact, an exhibition is an opportunity for visitors to rethink old ideas and investigate new possibilities. From the exhibitor's standpoint, it is an invaluable opportunity to gauge reaction to existing and new products, and get a hands-on feel for where the market is going.

That these opportunities are all too frequently missed means that exhibitors do not always get the “biggest bang for their buck” and that visitors have done little more than have a day away from the office. We have all visited exhibitions where stand or booth staff seem to do anything to avoid eye contact with potential customers, loiter at the back of the stand, or rock on the soles of their feet at the front edge of the stand virtually defying visitors to pass the threshold. Also, all too frequently it is possible to see stands where, in the few seconds that it takes to walk by and move onto other things, it is all but impossible to grasp with any certainty what the company is actually selling.

Not that exhibitors always get the attention they should have every reason to expect. Let me explain. A few years ago I visited the city-centre offices of a leading fire engineering consultancy, shortly after writing an article about recent developments in a particular area of fixed fire suppression. By chance, one of the engineers I met was working on a project where this technology could

reasonably have been considered appropriate. When I asked if there was a particular reason for his specifying the system he had chosen for the project he replied that it was because he had used it before. I asked if he had considered the system I had written about (and that also had been fairly widely promoted). No, he had not. Was he going to visit the company's stand at a then imminent major fire exhibition? Again, the answer was no. This prompted me to ask the senior consultant in the firm – which employed several fire engineers – how many were going to the exhibition. He was not even sure that he would attend himself.

I am not suggesting that these examples are widespread, but they do exist. Exhibitors spend a great deal of money over a short space of time when deciding to exhibit, so having a clear set of objectives, a well-managed stand and a thorough post-event review of how the company performed ought to be standard practice. As far as visitors go, I feel it is not unreasonable to expect everyone in the industry to attend if they are responsible for specifying, selecting, installing or maintaining fire safety products. None of us knows everything, and we collectively owe it to clients, customers and the public at large to be at the top of our game. And one way of helping to ensure this is to visit relevant exhibitions; to look, listen and learn. **IFP**

In the coming months staff from the three MDM Publishing titles – International Fire Protection, International Fire Fighter and Asia Pacific Fire – will be at: the Disaster & Emergency Management Conference in Queensland, Australia; the NFPA Conference & Expo in Las Vegas, USA; International Firex and IFSEC in London, UK; Fire Rescue International in Dallas, USA; and the Emergency Services Show in Birmingham, UK.



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**Olga Caledonia**

NFPA

# NFPA's Conference & Expo 2014

## Meeting the needs of our international members and volunteers

Every year, thousands of fire, electrical and building safety professionals from the United States and around the world come together for the National Fire Protection Association's (NFPA) annual Conference and Expo (C & E). This year, C & E takes place at the Mandalay Convention Centre in Las Vegas, from the 9th to the 11th June.

This is a very special year for many of our international delegations as James M. Shannon concludes his career as president and CEO at NFPA. Mr. Shannon served as NFPA president since 2002 and for the last 12 years has personally welcomed and hosted international delegations at the Association's Conference and Expo. As Mr. Shannon has always said, "The work of our members and volunteers is critical to our mission. The Conference and Expo is NFPA's chance to thank the many volunteers from around the world for their commitment and enthusiasm for promoting fire and life safety and using NFPA's codes and standards to keep their residents safer from fire and related hazards".

**Olga Caledonia** is Executive Director, International Operations at NFPA

For further information, go to [www.nfpa.com](http://www.nfpa.com)

Each year, we do our best to create a conference program that meets the needs of the fire protection and life safety industry. The 2014 educational program is no different and will offer more than 150 sessions in 13 educational tracks all aimed to provide attendees with the most current information. In response to the growing number of international attendees, this year's program incorporates a number of informative sessions with a global perspective. These include:

- Adoption of performance based requirements for the use of elevators for emergency egress – lessons learned in Australia.
- Adoption and implementation of NFPA codes and standards in the Middle East.
- Fire protection in the ready-made garment industry in Bangladesh.
- Canada's move toward mid-rise and tall wood buildings.
- Facing the fires of a meltdown lessons learned from Fukushima.
- Fire education in a multi-lingual community.

The conference program also offers two new tracks this year: "Health Care" and "Sustainability." Green buildings, alternative energies and associated processes/technologies are at the centre of many discussions relating to the built environment worldwide. In addition, the changing healthcare landscape including the challenges facing those who design, develop and maintain healthcare facilities is a critical topic for individuals in property and lifesaving roles.

A session titled, *A Mile from the Finish Line: When the Hospital Closest to the Boston Marathon Explosion had to Evacuate its Emergency Department*, is one such example that caught my eye. The Boston Marathon bombings were a tragedy covered by the international

media. The session will highlight the recent case study of the event, including insights and lessons learned. Explore the full conference program at [www.nfpa.org/conference](http://www.nfpa.org/conference). I guarantee you will find many of the topics relevant to your own experiences back home. Make the time to join us in Las Vegas this year and share your personal and professional experiences with us.

In addition to the tremendous educational opportunities you will experience at the 2014 C & E, attendees can also take advantage of the opportunities to network and interact with the many global distributors and manufacturers of fire protection equipment, and see demonstrations of the latest products/technology in the marketplace. Typically, new products are developed first, followed by changes in the code to regulate the installation and use of the product. The Conference and Expo is a great opportunity to gain insight on new products/technologies and understand the application of NFPA codes/standards with information regarding anticipated code revisions.

Make sure to also participate in the Association's General Session. The President and the Chairman provide a year-in-review of the Association's activities, and the role we play as a public service organization in the United States and around the world.

At NFPA we recognise the talent and efforts of our international constituents. That is why we do not want you to miss our international reception on Sunday, June 8th at the Luxor Hotel. This event is always popular and provides a great opportunity for our international colleagues to meet the NFPA "global staff" who participates in conferences and seminars around the world.

For more information about NFPA's Conference and Expo visit [www.nfpa.org/conference](http://www.nfpa.org/conference).

IFP

# Unique Solution for School Building

Fire engineering company, FDS CONSULT, created a bespoke fire engineering solution for the new 5,600 square metre floor area Littlehampton Academy in West Sussex; a structure with a floor area that is well above the maximum 2,000 square metre compartment size detailed under the English Building Bulletin 100 (BB100): design for fire safety in schools.

The solution was a combination of systems including a sprinkler system – which are common in schools with areas of more than 800 square metres – and a natural smoke ventilation system; a component not usually required in a school environment. This ventilation system utilised windows at the ends of the building's wings and at the head of the central voids to allow smoke to move from floor to floor and out through the clear stories. This ensured that, regardless of the location of the fire the smoke would not spread over a 2,000 square metre area, using



smoke venting methods to achieve virtual compartmentation. This solution also enabled the school to achieve an open classroom door policy.

This innovative approach to fire engineering enabled the client to achieve a whole school building in excess of 10,000 square metres as a single compartment without any cross-corridor doors.

While sprinkler systems usually require dual tanks, dual pumps, dual valves and zoning to conform to life safety standard, the FDS Consult team engineered the system down to the exact size and specification of the sprinkler system required. This resulted in the installation of a single tank and the removal of zoning, given that the school acts as a single zone.

For more information, go to [www.fdsconsult.com](http://www.fdsconsult.com)

## On-the-road Fire Safety



CHUBB FIRE & SECURITY has been awarded a three-year contract with Hoyer Petrolog UK – a supplier of transport and logistics to the petroleum industry – to provide and service nearly 1,000 Chubb FX fire extinguishers for Hoyer's fleet of 390 petroleum and bitumen tankers and 342 vehicles. The fleet services 21 customer locations across the UK, predominately operating from oil refineries and terminals.

The FX range provides quick-release mechanisms and ergonomically redesigned handles, levers and hose grips for intuitive activation and delivery of the highest performance when people or property are at risk. These features have improved fire safety ratings, and the entire range has been designed for environmental safety and end-of-life recycling.

For more information, go to [www.chubb.co.uk](http://www.chubb.co.uk)

## Bank Invests in Fire safety

HOCHIKI EUROPE fire detection products have been installed in the headquarters of one of the largest banks in Belgium; a stunning seven-storey structure, the curved outer perimeter of which houses offices while in the middle is a large atrium. Over 2,500 workers and visitors access the building every day.

Over 4,600 detectors were removed and replaced while the building continued to function as normal during the two-month contract. A total of 4,300 ALG-EN optical smoke sensors, which feature Hochiki Europe's High Performance Chamber Technology, were installed, along with 350 ACA-E multi-heat sensors and 160 HCP-E call points. To provide 100 percent visibility the fire detection network was linked to the Xtralis M3000 security management system (SMS), which is used to control and monitor the whole fire and security infrastructure. The project underwent a full test and certification process in accordance with the Belgian Organisation for Security Equipment Certification (BOSEC) and the National Organisation for Fire and Theft Fighting (ANPI).



For more information, go to [www.hochikieurope.com](http://www.hochikieurope.com)



# Introducing EN12845 FIRE PUMP LINE

Patterson Pump Ireland Ltd. specialises in the production of world class fire protection equipment around Europe.

From enquiry stage, right through design, manufacturing, installation and after sales service, Patterson Pump Ireland strives to provide a quality, reliable fire protection system, at the most competitive price.

EN12845 provides a pan-European standard for the design, installation and maintenance of automatic sprinkler systems, and encompasses the basic requirements set forth by local rules into one European Standard.

The new Patterson Pump End Suction product line is the latest addition to the Patterson Sentinel™ range. Cost effective and efficient, these will be used in fire pump packages specifically designed and built to comply with the regulations of European standard EN12845, along with other local rules.



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A Subsidiary of Patterson Pump Company U.S.A.  
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# Patterson



# Declaration of Conformity for Warning Signals Announced

E2S has announced new certifications for products from its fire and industrial, explosion-proof and wide area disaster notification portfolios. The new TR CU Declaration of Conformity certifies compliance to the new, harmonised Technical Regulations of the Eurasian Economic Community (Russia, Belarus and Kazakhstan) and fulfilment of safety requirements.

The new TR CU Certificate of Conformity for the Customs Union for safety of equipment for use in explosive atmospheres is mandatory for any electrical equipment that is to be operated, or installed, in hazardous areas and potentially explosive atmospheres in these countries. The certification enables products to obtain clearance at the Russian and Customs



Union borders. These certifications replace the GOST-R and Ex GOST-R national Russian certification system that is being gradually withdrawn.

For hazardous areas, the TR CU Certificate of Conformity covers the BEx and GNEEx explosion and flame proof signals and the IS intrinsically safe ranges. For fire and industrial applications the TR CU Declaration of Conformity is awarded for majority of the product ranges such as Sonora, AlertAlarm, AlertAlight, Spectra, Hootronic as well as many wide area disaster warning products and panel mount status lights.

These latest certifications add to the company's portfolio of worldwide approvals including ATEX, IECEx, UL, cULs, INMETRO

and VDS.

For more information, go to [www.e2s.com](http://www.e2s.com)

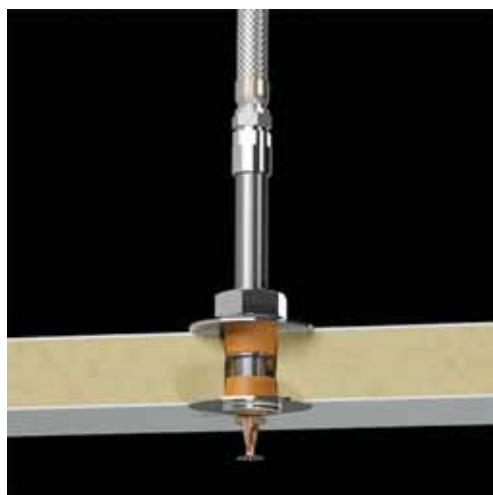
## New Cold Store Flexible System

VICTAULIC has introduced the VicFlex Style AB6 assembly for cold storage applications – reducing, the company says, hands-on installation time by as much as 75 percent.

In addition, the new VicFlex Style AB6 bracket eliminates condensation making it a safer option for cold storage applications. If openings in the freezer wall are not sealed air-tight, condensation can drip down the sprinkler barrel and freeze, interrupting the sprinkler's spray

patterns, which can be dangerous in the case of a hazard.

The new bracket can also combat differential movement between ceilings. This is important because in the event of seismic activity or any settling of a building, the external structure and the freezer box inside the structure can move in different directions. With hard pipe the seal and positioning of the sprinkler can be compromised during these times. However, when using flexible systems like VicFlex, the sprinkler will move with the activity and adjust accordingly.



For more information, go to [www.victaulic.com](http://www.victaulic.com)

## UL-Listed Extinguisher Seal

CAMBRIDGE SECURITY SEALS (CSS) has unveiled its newly designed adjustable plastic one piece seal that is UL-Listed (UL 299 and CAN/ULC-5504) and approved for use as a plastic security seal for fire extinguishers.

Each time a fire extinguisher is serviced or inspected, a single-use tamper-evident plastic seal is typically secured through the operating levers. In the event that the fire extinguisher is needed, the one piece seal is designed to be easily and irreversibly broken. The subsequent absence of a properly functioning seal serves to indicate its usage and the need for inspection and potential refill.

It features durable construction, flexibility, and space-saving packaging. While the standard fire extinguisher seal is 300mm, the OPS is available in four additional lengths (150mm, 175mm, 200 and 250mm). In addition to product length, CSS offers a wide variety of customised options including colour choices, sequential alphanumeric numbering and bar-coding, and a write-in box. The one piece seal also features the option of an extended flag to provide a greater surface area for additional information, service company logos, or promotional copy.

For more information, go to [www.cambridgeseals.com](http://www.cambridgeseals.com)



# Hospital Gets Intensive Fire Care



APOLLO FIRE DETECTORS' Discovery range of fire products was chosen to provide life and property protection at the new premises of The Royal London Hospital in the UK, now the largest stand-alone acute hospital building in Europe. Part of Barts Health NHS Trust, the hospital provides district general hospital services for the City and Tower Hamlets and specialist tertiary care services for patients from across London and further afield.

The hospital's new premises consist of three interconnecting tower blocks – two of 17 storeys and one ten storeys. At the top of one of the 17 storey blocks is a purpose built roof area for the hospital's helipad. There are 746 beds arranged over approximately 26 wards and 26 operating theatres. At peak times there are approximately 7,000 occupants within the hospital's building and grounds, including patients, staff and visitors.

In total, more than 10,000 Discovery units have been installed throughout the hospital's new building, including around 5,000 multi-sensor detectors, 150 heat detectors and 1,500 manual call points. The fire system consists of 37 main fire alarm panels with over 180 loops, 17 repeater panels and two master inter-ringing units (MIUs). These are monitored and managed by two central indicating equipment PCs; one in the fire command centre for occupation and use by attending fire officers and one in the 24/7 building management office.

The system, which monitors more than 500 zones, also includes approximately 3,500 input and output units. These interface with automatic fire dampers, access controlled doors, sprinkler flow and anti-tamper valves, lifts, motor control centres (MCCs), and initiates, via fire-fighter's control switches, smoke extract and purge fans.

For more information, go to [www.apollo-fire.co.uk](http://www.apollo-fire.co.uk)

## UL-Listing for Liquid Level Indicator

PORTALEVEL has announced that its MAX portable liquid level indicator has received UL Listing. It is available in two model types: Portalevel MAX and Portalevel MAX Marine (for shipboard use to enable SOLAS compliance) and designed for easy liquid level indication for CO<sub>2</sub>, FM-200, NOVEC 1230, FE-13, FE-25 and FE-36 HFC-225 and 227 and Halon 1301.

For more information, go to [www.portalevel-max.com](http://www.portalevel-max.com)

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**Manual call points:** break glass, push button and tool reset options.



Global product availability with a 5 year warranty.



[www.e2s.com](http://www.e2s.com)



# Total Flooding System Gets UL Listing

FIRETRACE INTERNATIONAL has announced that its E<sup>4</sup> engineered clean agent total flooding system has earned the distinguished Underwriters Laboratories (UL) Listing.

In the announcement, Firetrace says that E<sup>4</sup> delivers a host of substantial and measurable performance enhancements when compared with traditional clean agent total flooding systems. These include superior performance, greater flexibility, improved value, speedier installation and a measurable competitive edge for system installers. It is described as: "Setting a new standard for total flooding systems by using low cost, low pressure hardware while delivering performance that has been typically associated with high cost, high pressure systems."

E<sup>4</sup> systems can be safely pressurized to 500psi (34.5 bar) in low pressure hardware, thanks to the properties of Novec 1230.



The increased pressurization enables significant performance gains when compared with traditional total flooding systems that conform to conventions developed for Halon in the 1980s;

conventions that were continued by many HFC and Novec systems.

E<sup>4</sup> offers greater design flexibility and lower overall hardware and installation costs, delivering a dramatic increase in both vertical and horizontal cylinder-to-nozzle distances when compared with traditional clean agent total flooding systems. E<sup>4</sup> systems use between 25 percent and 40 percent less piping and provide 700 percent-plus liquid agent-to-pipe volumes.

Systems are available in eight cylinder sizes with fill volumes ranging from 8 lbs (4 kg) to 1,300 lbs (590 kg), with the 1,300 lb cylinder being the largest single-unit fire suppression system in the industry. E<sup>4</sup> is compatible with most popular releasing panels and complies fully with every aspect of NFPA 2001: 2012.

For more information, go to [www.firetrace.com](http://www.firetrace.com)

## New Compliant AV Warning Devices



KAC ALARM COMPANY has developed ENScape, a new range of EN54-3 and EN54-23 approved conventional AV warning devices for use in fire detection systems. Offering what the company claims is outstanding performance, fast installation and safe evacuation for

all building occupants, ENScape reduces costs for contractors and improves the effectiveness of audible visual alarm devices for end users.

EN54-23 sets a base level for performance so that visual alarm devices (VADS) provide a defined level of illumination. It became mandatory under CPR from 1st January 2014 and so ENScape beacons and sounder beacons have been designed specifically to meet this requirement. With innovative electronics and advanced optics providing high light output at low current draw, ENScape beacons and sounder beacons minimise the overall number of devices required. The sounder only devices are approved to EN54-3 with a global tone set of 32 tones, and flexible alarm settings allow for phased evacuation.

ENScape beacons provide all building occupants, particularly the hearing impaired, improved warning of fire alarm or evacuation conditions, while increasing safety in areas where high ambient noise levels render sounders ineffective. Separate sounders, beacons and combined sounder beacons fit a variety of bases. Any of the devices can be installed on a wall or ceiling. KAC's first fix capability allows wiring to be tested without the active devices being installed; this interchangeable modular design enables simple system set-up and later reconfiguration if required.

For more information, go to [www.kac.co.uk](http://www.kac.co.uk)

## Stadium Fire Panel Scores



C-TEC's new ZFP touch-screen controlled addressable fire panel has been installed to safeguard Mansfield Town football team's 10,000-seater One Call Stadium in Nottinghamshire in the UK.

The ZFP boasts user-friendly touch-screen controls, powerful networking capability and flexible cause and effects. One 4-loop panel and a repeater panel link to the existing system of Apollo detectors and sounders to provide high levels of fire protection throughout the stadium, which not only hosts football games but also entertainment events. The panel is located in the stadium's reception area where it can be easily accessed by authorised personnel. Its modular nature means it can be easily added to in the future should the stadium undergo expansion.

Now available with a graphical interface solution that allows users to view critical events, process alarms and keep secure system logs on a remote PC, the ZFP panel can be configured to suit any application, from small 'one out, all out' systems to large multi-loop networked systems.

For more information, go to [www.c-tec.co.uk](http://www.c-tec.co.uk)

# City Chooses Sprinkler Casings

PENDOCK pipe box casings have been specified by Leeds City Council in the UK to conceal and protect a sprinkler system at Marsden Court, a 13-storey sheltered housing scheme comprising 71 apartments. The decision follows the recent inquests into two fatal fires at high-rise blocks in the South of England in 2009 and 2010 that highlighted the need for increased fire safety in high-rise accommodation. Coroners issued Rule 43: 'Recommendations to prevent future deaths', suggesting that housing providers should retrofit sprinklers to high-rise blocks. As a result, West Yorkshire Fire and Rescue Service are supporting a pilot scheme to retrofit sprinkler systems across the high-rise housing stocks managed by a number of different local authorities.

Leeds City Council is among an increasing number of social



landlords across the UK that are already retrofitting sprinkler systems, and the Council specified Pendock for the supply of 2,100 metres of 8mm MX profile pipe boxing in a white melamine finish to conceal and protect the sprinkler system at Marsden Court. The casing was installed at high level in communal corridors and residents' apartments including the bedrooms, living rooms, kitchens and hallways. The MX range fulfilled the Council's requirement for a profile that was aesthetically pleasing but also ensured that all the orange sprinkler pipework was concealed.

Care was taken to ensure that the optimum balance of profile size and aesthetic effect was achieved.

For more information, go to [www.pendock.co.uk](http://www.pendock.co.uk)

## Heat Sensor Gets ATEX Certification

The 5610 infra-red transit heat sensor from PATOL has been awarded ATEX and IECEx certification for use in hazardous areas with the potential for dust explosion. It is housed within an explosion-proof Exd enclosure inside which any internal explosion or electrical problem would remain restricted in order to prevent propagation to any potentially explosive atmosphere outside.



The sensor is part of the 5000 Series from Patol, and the 5610 has been specifically created for hazardous environments for providing protection on conveyor belts or systems wherever materials are being continuously transported, when the capacity for self-ignition provides an exceptional threat. The 5610 model is ATEX and IECEx approved for Zone 21 and 22, where combustible or conductive dusts are present. The 5610 includes sensitivity settings, auto/manual reset sequence and single/coincidence voting from the two individual internal detectors for the alarm trip shutdown outputs.

The Series 5000 range uses enhanced monitoring technology via twin, high-integrity detection circuit channels for maximum reliability. It is specifically designed to protect working environments where the potential for fire or explosion is a common condition, even where the constant movement of combustible materials is a routine occurrence. The range has applications within a host of industries such as power generation, coal mining, process plant, road transportation and rail networks and has been specifically designed to meet the rigors of these environments and to provide the required reliability.

For more information, go to [www.patol.co.uk](http://www.patol.co.uk)

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# New Intrinsically Safe Sounder Module

HOCHIKI EUROPE has announced the latest addition to its range of intrinsically safe compatible devices – the CHQ-ISM sounder module.

With a similar look and feel as the standard modules in the range, the CHQ-ISM is designed for use in the 'safe' area of a hazardous area fire detection system and, therefore, does not require specialised certification. It allows any third-party sounders and beacons installed in the 'hazardous' area to be controlled and monitored by an analogue addressable control panel that is configured around the company's Enhanced Systems Protocol (ESP). The unit is wired either directly to the panel via the conventional sounder circuits – receiving its 24V power supply from the panel – or via a CHQ-DSC sounder controller module connected to the loop, where it requires a separate



24V power supply.

In both instances a suitable intrinsically safe barrier must be used. Hochiki supplies two recommended barriers for this purpose: the MTL5561 galvanic isolator or the MTL7787+ Zener barrier. The module

also provides line monitoring for open or short circuits on the wiring connected to both the 'safe' and 'hazardous' areas.

Intrinsically safe devices are incapable of releasing sufficient electrical or thermal energy to cause the ignition of a specific hazardous atmospheric mixture in its most easily ignitable concentration. This is achieved by limiting the amount of power available to the electrical equipment in the hazardous area to a level below that where ignition is possible. The low

power levels also mean that there is no shock hazard due to excess thermal energy and arcing.

For more information, go to [www.hochikieurope.com](http://www.hochikieurope.com)

## VISION INT'L

Manufacturer & Integrator

Sprinkler System Pipe Fittings, Hangers, Valves, Miscellaneous



As a leader of grooved piping system in china, VISION has more than 15 years for design and manufacture of grooved couplings & fittings. At the same time, we also manufacture and integrate many components of sprinkler system and pipe pre-fabrication.

Whoever you are Contractor, wholesaler, distributor or fabricator, you may find components of sprinkler system in VISION INT'L. Here we look forward to supply high quality products & services to you, that will reduce your cost of sourcing, and increase your competitiveness.

### Products Line



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	Pipe Hanger & Clamps	UL & FM
	CPVC Straps	UL
	Sprinkler Hose	UL & FM



	Butterfly Valves	UL & FM
	Bronze Butterfly Valves	UL & FM



	OS&Y Gate Valves	UL & FM
	Post Indicate Valves	UL & FM



	Swing Check Valves	UL & FM
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F : 0086-21-5954-3888  
E : [samwu@visioninc.com](mailto:samwu@visioninc.com)

[www.visionpiping.cn](http://www.visionpiping.cn)  
NingBo VISION Pipe Fittings Co., Ltd  
VISION International

## Easy Detector Test

DETECTORTESTERS has launched Scorpion, a new remote test solution enabling all smoke detectors in a building to be safely and efficiently tested every year, including areas where the detection is not easily seen or accessed including in lift shafts, void spaces above ceiling tiles, underneath floor tiles, or behind architectural features – often areas where cables for power and data are also found. Other detectors may be in areas behind locked doors, such as IT rooms, stores and archives, or other secure areas. While the detectors themselves may be easy to reach, getting access to them is restricted.

Scorpion is a micro smoke generating head unit permanently installed adjacent to a sampling hole on an aspirating smoke detection (ASD) pipe, or adjacent to a point smoke detector. The smoke generator is connected to a control panel mounted in a convenient location at ground level or outside the secure area. Testing of any detector then takes one person a matter of minutes, via a simple press of a button on the control panel.

Scorpion has been installed on the ASD system in an automated warehouse in Sweden, where it protects the goods and automated picking machines necessary to meet the demands of the store's hundreds of thousands of customers. Routine maintenance of the fire system no longer needs the warehouse to be shut down, and no access equipment is needed to reach the pipes.



For more information, go to [www.scorpion-tester.com](http://www.scorpion-tester.com)



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# Fulleon's 'LX' Beacons: High Output with Low Energy Usage

To meet growing demand for visual alarm devices (VADs) and ensure compliance with European EN 54-23 manufacturing standards, Eaton's Fulleon Business has developed the LX range of fully certified beacons.

The range comprises of a wall category and ceiling category beacon, a low current sounder beacon, a low current IP66 sounder beacon and a RoLP (Roshni) sounder beacon, which is fully compatible with all existing RoLP Sounders.

The most recent addition to the range is the highly efficient Squashni Base LX ceiling device. The Squashni Base LX delivers a coverage volume radius of 15 metres and a square area of 10.6 metres, in line with the spacing specifications for both smoke and heat detectors. The device's universal fitting means almost all detectors can be incorporated directly into the unit. This reduces the number of products that would ordinarily be needed in a large public space, as there is no need for separate installation points for detection and notification products. Further economies are achieved by the low current consumption of the unit.

## Maximum Coverage, Minimum Consumption

The LX range was developed to provide the lowest possible current consumption while still giving the highest possible light output, so as to maximise the number of devices on a circuit.

The LX range centres on patented lens technology that manages the distribution of light with extraordinary efficiency. Any light distributed outside of the necessary volume prescribed in EN 54-23 is a waste of power; the LX lens refracts light to remove hot spots (concentrated areas of light intensity) directly in front of the LED before re-distributing the light to illuminate dark spots. This method delivers the intensity of light required whilst minimising current consumption.

## EN 54-23 Compliant Red Flash

EN 54-23 allows for either a red or a white flash. In many parts of Europe a red flash is synonymous with fire. To develop a red flash option that achieves the required 0.4 lux specified by EN 54-23, without compromising the current consumption, is extremely challenging. With the LX range, this has been achieved; LX products are available in either a red or white flash with no compromise on current consumption.



## Help with Specifying & Product Selection

The FIA and LPCB have produced a Code of Practice, CoP0001, to help system designers specify the placement of visual alarm devices. In the recent update to BS5839-1 2013, CoP0001 is referenced, where the use of alarm beacons is chosen as a solution to a risk assessment.

Eaton's Fulleon business aims to make the transition to meet the new requirements as simple as possible. An online specification tool for the LX range has been developed, which will identify how many devices are required and their combined current consumption for a given area. The tool allows the user to quickly assess the impact of changing the flash rate and the type of product selected.

A 20-page pocket guide, 'Introduction to EN 54-23', has been created to help with the planning, installation, commissioning and maintenance of VADs. Further resources, including offline design tools and product certificates are also available.

IFP

For more information, go to  
[www.cooperfulleon.com](http://www.cooperfulleon.com)

# Low current, maximum coverage.



## Eaton and Cooper – united to power more possibilities.

Eaton's Fulleon business is known for its market leading solutions. The new LX beacon range is the latest innovation designed to offer a low current solution to the demanding EN 54-23 standard. LX is a range of beacons and sounder beacons, all with a room coverage of up to 7.5m and drawing a current as low as 10mA, with a red flash. It's difficult to beat the LX range for consumption and coverage, it's the new standard for Visual Alarm Devices.

Download the pocket guide to EN 54-23 at:  
[www.cooperfulleon.com](http://www.cooperfulleon.com)



- Solista LX Beacon**
- Wall or Ceiling Option
  - Slim-line Design
  - Easy Installation



- RoLP LX Sounder Beacon**
- Proven Sounder
  - Beacon Base Option
  - Retrofit Sounder Option



- Symphoni LX Sounder Beacon**
- Proven Sounder
  - Low Current
  - Beacon Base option



- Symphoni LX WP Sounder Beacon**
- Proven Sounder
  - Low Current
  - IP66 rating



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For your safety



# The EZ-Path Fire Rated Pathway System

EZ-Path Fire Rated Pathways are designed to facilitate the installation of cables through fire-rated walls and floors. These products are a perfect choice for new cable installations but also split apart to allow use with previously installed cables. A wide variety of accessories make the installation of these products a quick and easy task.

**E**Z-Path provides a mechanical approach to cable fire-stopping, eliminating the need for sealants or putties. Unlike other products there is nothing to remove, replace, adjust, or tighten. It is the only zero-maintenance cable management system. From installation (empty) to 100 percent visual fill, it remains fire and smoke compliant . . . 100 percent of the time.

## Easy Installation & Cable Changes Without Fire-stopping

- Maximum Fire Protection**  
 EZ-Path features a built-in fire-stopping system that automatically adjusts to the number of cables installed. The device consists of a heavy-gauge galvanized steel pathway and wall plates lined with intumescent materials. Fast-acting intumescent performance: engineered for rapid expansion when exposed to fire or high temperatures, this intumescent material responds to flames or heat by quickly sealing the pathway and preventing the passage of fire and smoke.
- Quick Economical Installation**  
 The all-in-one design EZ-Path installs in minutes. There is nothing else to buy and no coordination of trades required.



- Professional Engineered Appearance**  
 EZ-Path installations offer a clean, professional, engineered appearance that appeals to owners, tenants, and inspection authorities. The device is coloured safety orange and comes with wall labels for easy identification.
- Low Leakage 100 percent of the Time**  
 EZ-Path is a low-leakage device that remains fire and leakage safe whether empty or 100 percent visually filled. Sleeves are subject to cable load and putty variations and can become non-compliant as cables are added and putty is removed. Other products require adjusting or tightening for compliance.

**EZ-Path Fire Rated Pathways provide a mechanical approach to cable fire-stopping, eliminating the need for sealants or putties. Unlike other products there is nothing to remove, replace, adjust, or tighten. It is the only zero-maintenance cable management system.**

- Efficient, Expandable & Quick, Easy Cable Changes**  
 Available in three sizes, EZ-Path provides greater cable loading than a conventional 102 mm sleeve. Cables can be added or changed without the need to remove and reinstall fire-stopping materials. EZ-Path will pay for itself in just a few cable changes. Single or multiple EZ-Path devices can be installed using available single, duplex, or triplex wall plates — for additional capacity, segregation of cables, and cable management.
- Always Code Compliant**  
 EZ-Path is UL Classified and FM Approved in accordance with ASTM E814 (UL1479). Additionally, the device bears the CE Marking based on testing to EN1366. Approved fire-stop systems are available for up to four-hour rated floor and wall constructions. Empty or full, EZ-Path is continuously code compliant . . . 100 percent of the time. Its innovative built-in fire-stop design assures it is fire-stopped even at maximum cable loading.

For more information, go to  
[www.stifirestop.com](http://www.stifirestop.com)

IFP



A large background image of a firefighter in profile, looking towards the left. He is wearing a dark jacket and a yellow and black MSA air tank is visible on his back. The scene is dimly lit with blue and red light.

# Safety Solutions for **Firefighters**



It was a horrific workplace tragedy that led to the creation of MSA back in 1914. In the decades that have come and gone, we've never forgotten where we came from, or why we're here. At MSA, your safety is what drives us every single day. Our goal is to provide our customers with dependable, high-quality safety solutions to help ensure a safe return home at the end of each work day.

**Around the world, firefighters rely on MSA for personal protection. Join them!**

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# Critical Asset Fire Protection

## 3M to Focus on Critical Asset Fire Protection at NFPA Expo

Any serious discussion of critical asset fire protection must include not only considerations of safety and effectiveness – it must also take into account the long-term economic and environmental sustainability of the fire protection agent itself. That is why it is important to choose a technology that not only provides fast extinguishment, but is also not burdened with the likelihood of use restrictions or phase-outs.

**3M** Novec 1230 Fire Protection Fluid is an advanced alternative to previous generations of clean agents such as Halons and HFCs. It was designed at the molecular level to address the need for extinguishing efficiency, human safety and environmental sustainability. Novec 1230 fluid knocks-down fires over twice as fast as inert gas or CO<sub>2</sub>; extinguishing flames before they have a chance to spread. It also offers the widest margin of safety relative to other chemical clean agents, CO<sub>2</sub> and inert gas mixtures.

As a clean agent, Novec 1230 fluid is safe for use on sensitive electronics and allows uninterrupted operation of energised equipment – keeping essential facilities up and running in the event of a fire. The agent is stored as an unpressurised liquid, making transportation much less complicated than gaseous materials, contributing to a more cost-efficient supply chain.

With zero ozone depletion potential, a global warming potential of one and an atmospheric lifetime of just five days, Novec 1230 fluid can deliver up to a 99 percent reduction in greenhouse gas emissions relative to HFCs – making it today's sustainable solution for critical asset fire protection.

### For HFCs, an Uncertain Future

Several regulatory initiatives launched in 2014 herald a change in the status of HFCs – with global implications. For example, the European Parliament



*Water or dry chemical fire protection agents in data centers and telecom rooms can seriously damage sensitive equipment and interrupt critical services. Novec 1230 fluid is a safe, sustainable alternative that can help maintain continuity of operations.*

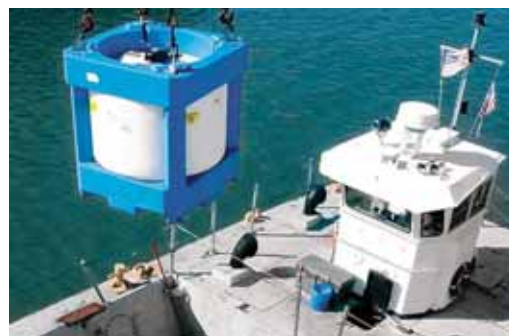
has voted to support a proposal to cut the use of HFCs by 79 percent by 2030. The U.S. EPA has already announced that it will propose a rule in 2014 to change the status of HFCs under SNAP, in an effort to reduce the use of HFCs and promote low-emissions technologies.

Areas such as the Middle East may not see an immediate impact, but the global regulatory trends are clear; today's policy realities suggest a future that severely restricts or financially burdens those using HFCs for their fire protection solutions. Fortunately, in Novec 1230 fluid, the fire suppression market has a proven, cost-effective and sustainable alternative that is available today.

IFP



*Novec 1230 fluid is an ideal alternative for protecting facilities such as data centers, control rooms, museums and archives whose contents could be irreparably damaged by water, foam and dry chemical agents.*



*Low acute toxicity, combined with high extinguishing efficiency, gives Novec 1230 fluid a significant margin of safety – making it ideal for occupied spaces aboard ship and in communication and control centers.*

For more information,  
go to [www.3M.com/novec1230fluid](http://www.3M.com/novec1230fluid)



# 3M™ Novec™ 1230

Fire Protection Fluid

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Novec™ 1230  
GWP = 1

3000+  
HFCs

# Created for Life

3M™ Novec™ 1230 Fire Protection Fluid is a clean agent created for life. It not only protects your equipment, it protects your people with the largest margin of safety of any chemical halon replacement. With a global warming potential of 1 and an atmospheric lifetime of only 5 days, Novec 1230 fluid provides a 99.97% reduction in emission of greenhouse gas compared to hydrofluorocarbon (HFC) clean agents. To find out why a little TLC for our planet is also smart business, visit us at [www.3M.com/Novec1230Fluid](http://www.3M.com/Novec1230Fluid)



# NFPA Conference 11th June, 2014

## Premier Event in Fire & Life Safety Back



Every year, thousands of the top fire, electrical, and building safety professionals from all over the USA — and around the world — consider attendance at the NFPA Conference & Expo a “must”. The 2014 NFPA Conference & Expo, is widely regarded as the most comprehensive event in the industry. Convening at the Mandalay Bay Convention Centre, the event combines an unrivalled educational conference with an expo of more than 300 solution providers.

### **Why Do They Keep Coming Back?**

They know there is no better place to be when they are looking for ways to do a better job; update their knowledge; solve a problem . . . save money; make more money; keep up with their competition, and much more. In general, show their commitment to a very important shared mission.

That mission has been the NFPA’s for more than a hundred years—reduce the pain, suffering, and financial burden created by a fire, an explosion, or an unsafe electrical discharge.

### **Who is the NFPA?**

NFPA is the world’s leading advocate of fire prevention and an authoritative source on public safety. NFPA develops, publishes, and disseminates more than 300 consensus codes and standards intended to minimise the possibility and effects of fire and related risks. It publishes 300 codes and standards that influence every building, process,

service, design, and installation in the USA and many other countries.

These codes have been developed by its members and other industry stakeholders over the course of the Association’s 115 years of concerted effort, and are continuously refined through research, training, communication, and a robust consensus building process.

The annual event, the NFPA Conference & Expo, plays a key role in developing and disseminating code information through a comprehensive technical program, and for the ever-evolving consensus codes, the Association Technical Meeting where revisions, motions, and consent documents are presented and voted on.

### **Who Should Attend NFPA Conference & Expo?**

Professionals concerned with protecting people and property in any and all building and facility



# & Expo – 9th to

## in Las Vegas in June



types, and anyone who shoulders responsibility in the areas of: fire prevention; life safety; electrical safety; premise security; building design and management; fire and emergency services; and loss control and risk management.

### Conference Program

The 2014 conference offers more than 150 educational sessions, divided into tracks to help attendees identify sessions that best meet their professional needs. Plus, two new tracks have been added this year – sustainability and health care.

- **Building & Life Safety**

Technologies, best practices, and statistical data needed by designers, engineers, and building and fire officials responsible for plans review, inspections, and other building-related tasks.

- **Codes & Standards**

Expert guidance on the practical application of NFPA codes and standards, as well as information on recent updates and changes.

- **Detection & Notification**

Code requirements and design issues affecting the application of new technologies in alarm and signalling systems, and the impact of maintenance on systems performance.

- **Electrical**

Best practices in the electrical industry and how they are influenced by new electrical design

issues, successful maintenance programs, effective inspection techniques, and safety programs.

- **Emergency Preparedness/Business Continuity**

The latest methodologies for accurately assessing risks and consequences, emergency preparedness, contingency planning, incident management and recovery capabilities.

- **Fire & Emergency Services**

A look at what is new in firefighting technology, safety preparedness for first responders, incident command strategies, and fire prevention and inspection techniques.

- **Fire Protection Engineering**

Ideas for meeting fire protection challenges using computer modelling, field testing, post-incident analyses, and other methods for developing performance-based building solutions.

- **Fire Suppression**

The importance of proper design, installation, inspection, testing, maintenance, and plans review on sprinkler system effectiveness.

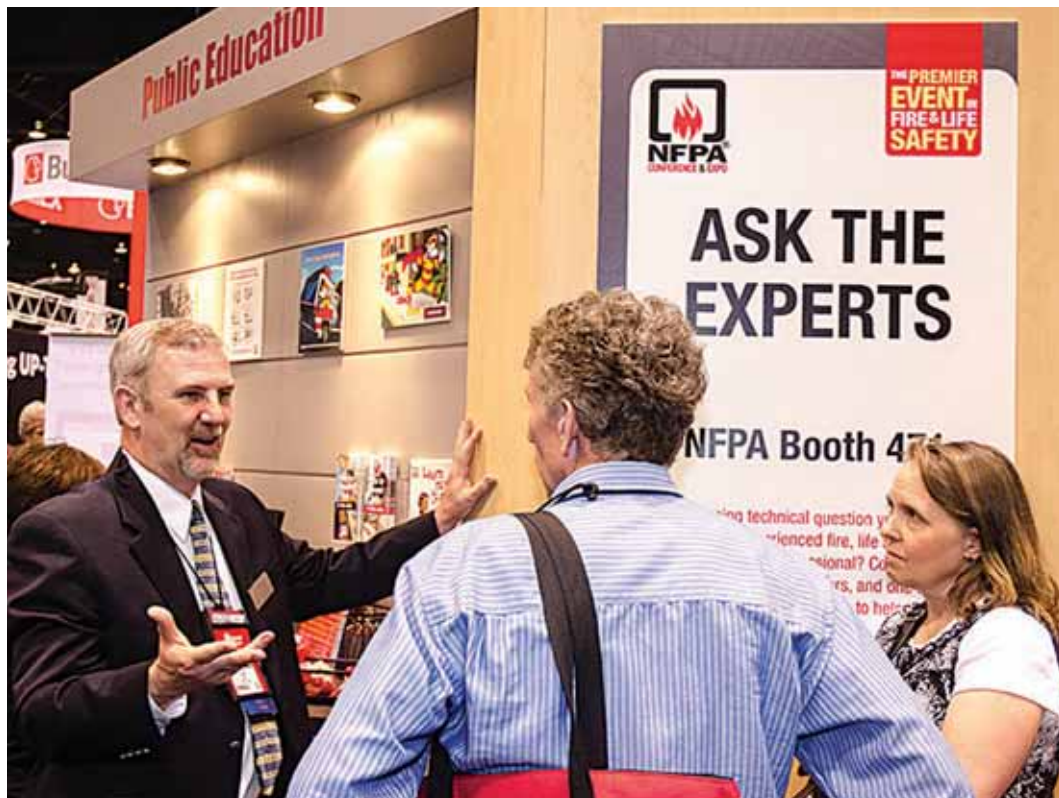
- **Health Care**

In recognition of the changing healthcare landscape and the challenges facing those who design, develop, and maintain health care facilities.

- **Loss Control/Prevention**

Strategies for mitigating risk through accurate





assessment of occupancy and commodity classification, enhanced reliability of fire protection systems, and other risk factors.

- **Public Education**

New planning strategies and creative solutions for meeting the challenges of effective public fire and life safety education.

- **Research**

The latest research into critical fire and life safety initiatives, including the reliability of emerging technologies.

- **Sustainability**

Addresses a broad range of topics related to green building, alternative energy sources, and associated processes and technologies.

## Record-setting Exhibition

Alongside the conference programming is a three-day product exposition featuring the world's top suppliers. Over three hundred exhibitors will be demonstrating the latest products, technologies and equipment for fire prevention and suppression; alarming and mass notification; system design and installation, testing, maintenance; and enhancing life safety measures.

## The NFPA Technical Meeting (Tech Session)

The NFPA Technical Meeting (Tech Session) is an important step in developing a complete record to assist the Standards Council in determining the degree of consensus achieved on proposed changes to NFPA documents. During this meeting, NFPA members are given an opportunity to vote on proposed changes and members of the public can voice their opinions on these actions. NFPA Technical Meetings are held annually at the NFPA Conference & Expo.

The 2014 NFPA Conference & Expo constitutes the first NFPA Technical Meeting (Tech Session)

under the revised Regulations Governing the Development of NFPA Standards (Regs). Under these regulations, there will no longer be versions of the Report on Proposals (ROPs) and Report on Comments (ROCs). In addition to the Final Motions Committee Report, the Complete Committee records (First Draft Report and Second Draft Report) including all changes to the appropriate NFPA Standard and additional relative material, are accessible through the Next Edition tab of the specific Document Information page, [www.nfpa.org/document](http://www.nfpa.org/document) for your review prior to the Technical Meeting (Tech Session).

## Register and Book Your Hotel

You can register in advance at [www.nfpa.org/conference](http://www.nfpa.org/conference). The exhibition is free when you pre-register.

## Get the NFPA Conference & Expo App

To get the most out of your time at the show, add the NFPA Conference & Expo mobile app to your phone or tablet (available 30 days before the event) and create your own customised schedule. Search and add conference sessions you would like to attend, flag exhibits you plan to visit, and then access your custom, time-saving schedule during the show!

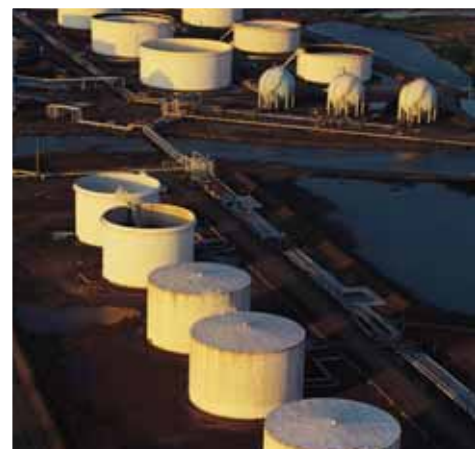
For the free download, search NFPA 2014 C&E on the app store of your choice, or scan this QR code with your smartphone or tablet.



## See what is Happening Now

Visit the event blog for the latest updates, coming attractions, and local colour . . . <http://nfpa.typepad.com/conference/>





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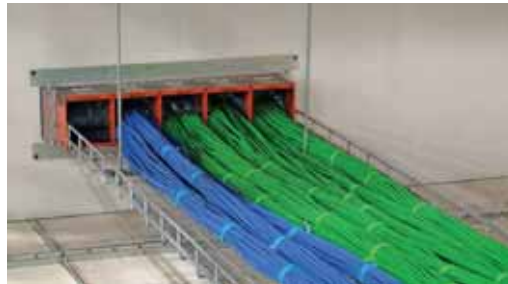
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# What's on Show at the NFPA Expo

## STI to Showcase EZ-Path Fire Rated Pathways



EZ-Path fire-rated pathways from SPECIFIED TECHNOLOGIES INC. (STI) are the ideal solution in applications where grouped cables traverse fire-rated construction. EZ-Path is a cable management device that integrates a built-in fire-stopping system consisting of a rugged steel shell with self-adjusting foam pads that automatically adjust to cable loads and form a membrane to seal against fire, smoke, and superheated gases. These pads are made from intumescent material that expands when exposed to temperatures in excess of 177°C and seal even the most combustible cable jacket and insulation materials.

EZ-Path devices can be configured to a wide array of different applications through the use of available wall or floor mounting accessories. Many mounting plate kits allow for multiple devices to be ganged together allowing for increased cable capacity. Mounting accessories are designed to maximise the volume of cable while minimising the amount of floor or wall space required. All EZ Path accessories are robust enough to handle the rigorous cable pulling process.

The EZ-Path system is a unique, maintenance-free solution providing 100 percent code compliance 100 percent of the time.

**Booth Number: 1846**

For further information, go to [www.stifirestop.com](http://www.stifirestop.com)

## Firefly to Launch New Omniguard Flame Detector

FIREFLY will launch its new flame detector model 760 multi-spectrum infrared IR4 at NFPA. This four-channel IR flame detector is, as all other Omniguard models, highly immune to false alarms. It utilises Fire Event Analysis (FEA) discrimination technology and is particularly developed for industries where there is a need for the detection of hydrocarbon fires.

This new four-channel IR flame detector is the first in a series of upcoming new Firefly developments on the flame detection market.

**Booth Number: 1435**

For further information, go to [www.firefly.se](http://www.firefly.se)

## New Deluge Valve from OCV

OCV CONTROL VALVES offers a complete line of high performance listed and approved valves. Its new 74FC deluge control valves are designed specifically to be used in deluge, pre-action, foam-water and other special systems. The 74FC Series is UL Listed for deluge service in globe pattern for sizes 75mm through 250mm. It is a simple on-off valve that utilises an innovative oval design, which maximises both flow capacity and control while minimising head loss.

The innovative oval design also creates stable and accurate control during shut-off and regulation, providing versatile range ability and low flow control. The diaphragm design provides resistance to cavitation and erosion, ensuring smooth flow without turbulence or noise. The one-piece actuation design creates an unobstructed flow passage with minimal maintenance. The valves are supplied with several coating options that provide superior protection against seawater, brackish water and other abrasive fluids.

The 74FC Series has three popular models: the 216FC, 216-3FC and 216-4FC. The 216FC is operated through a pneumatic pilot, the 216-4FC is operated electrically through a solenoid and the 216-3FC has the option to be operated both pneumatically or electrically.

**Booth Number: 1554**

For further information, go to [www.controlvalves.com](http://www.controlvalves.com)

## Victaulic to Feature Improved Firelock Series

VICTAULIC, a leading manufacturer of mechanical pipe-joining and fire protection systems, will be at NFPA featuring the improved FireLock Series 745 Fire-Pac, which includes innovative new options while maintaining the same small Fire-Pac space requirements.



The Victaulic Fire-Pac is a pre-assembled fire protection valve and trim that is pre-wired to a fire alarm control panel or junction box and enclosed inside a metal cabinet. The improvements give customers more options and benefits for installation, maintenance and design.

The new FireLock Fire-Pac design relocates the electrical connection box from on top of the cabinet to a location inside the cabinet, creating a lower profile and allowing the cabinet to fit





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learn more about the VicFlex system.



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through standard doorways for ease of delivery and installation.

It can be used in a wider range of operating environments thanks to new insulation and heating components for ambient temperatures as low as  $-6^{\circ}\text{C}$ . The FireLock Series 745 is also weatherproofed to an equivalent of NEMA 4 standards to keep out moisture and dirt. The FireLock Series 745 Fire-Pac is FM Approved and cULus Listed. All electrical enclosures and connections are UL Listed, and all materials and wiring conform to NFPA requirements.

**Booth Number: 633**

For further information, go to [www.victaulic.com](http://www.victaulic.com)

## Coltraco to Show Permalevel Multiplex System

COLTRACO a UK-based OEM manufacturer of ultrasonic measuring solutions, will be showcasing its Permalevel Multiplex system. The 24/7 data-enabled, data-recordable audit trail capable and remote diagnostic system is the world's first system capable of monitoring the contents of fixed fire suppression systems containing  $\text{CO}_2$ , FM-200, NAF S 225, NAF S 125 and Novec 1230

The system was developed to help customers in high risk industries, such as oil and gas, data centres and high rise buildings, to better protect their assets. Permalevel Multiplex gives users the ability to monitor up to 700 cylinder points 365 days a year, 24 hours a day. Users can be safe in the knowledge that if they do suffer from accidental discharge or seepage then Permalevel Multiplex will pick up on it.

Giving users the ability to check their fixed fire suppression system in real time helps cut maintenance costs and maintenance time scales. It is primarily the high end users who are going to be able to justify the cost of a system such as this. However, if the industry can be better educated to the idea that testing a system once a year is not adequate, then Permalevel Multiplex will be helping to make business run more smoothly and safer.

**Booth Number: 2153**

For further information, go to [www.coltraco.com](http://www.coltraco.com)

## BRE Global at NFPA



Independent third-party organisation BRE GLOBAL, based in the UK and with representative offices in China, India and Malaysia, will be showcasing its offering of

certification of fire, security and sustainability products and services to an international market. LPCB (Loss Prevention Certification Board) – accepted worldwide – is the certification brand used for fire and security products and services and its listings can be accessed, free of charge, at [www.redbooklive.com](http://www.redbooklive.com) or via apps from Apple, Google and Windows.

BRE Global carries out training, fire risk assessment, research and fire safety engineering

and is also a Notified Body and Notified Test Laboratory for Construction Products Regulation, Pressure Equipment Directive, Marine Equipment Directive and Transport Pressure Equipment Directive.

**Booth number: 858**

For further information, go to [www.bre.co.uk](http://www.bre.co.uk)

## Pentair to Spotlight End Suction Pumps

PENTAIR offers a full line of UL-Listed, FM-Approved fire pumps including end suction fire pumps. Built to the same quality standards of all Pentair fire pumps and compliant with NFPA standards, the pumps feature robust performance in a smaller, more economic footprint.



Pentair's end suction fire pumps offer a broad operating range of flows from 190 litres-a-minute to 5,680 litres-a-minute with pressures from 40 psi to 225 psi (2.8 bar to 15.5 bar). The pumps can be driven at 50 Hz or 60 Hz electric motor speeds as well as a range of diesel engine speeds, providing flexibility to address a wide range of fire applications worldwide. Combining the smaller footprint and stainless steel impellers, the end suction fire pumps offer an efficient, cost-effective design solution for small spaces and retrofit installations.

The end suction pump joins Pentair's full line of UL-listed, FM-Approved fire pumps including Aurora and Fairbanks Nijhuis horizontal and vertical split case, vertical inline, and vertical turbine pumps. Aurora's Edward Series features rotary gear pumps for foam concentrate and water mist applications. In addition to a full line of listed fire pump packages, Pentair also offers custom and pre-engineered fire pump systems.

**Booth Number: 1733**

For further information, go to [www.pentair.com](http://www.pentair.com)

## Tornatech to Demonstrate Fire Pump Controllers

TORNATECH will be demonstrating its fire pump controllers with ViZiTouch Operator interface. The company specialises in conceiving and manufacturing fire pump controllers in accordance with the NFPA 20 standard, listed with UL and approved by FM. Its products have proven to be reliable property loss equipment in many mechanical rooms worldwide.

The complete line of electric and diesel fire pump controllers feature: the ViZiTouch colour touch screen operator interface with a 107 mm colour display with intuitive graphics, quick and easy commissioning, user friendly operation and maintenance data logging capabilities for approximately the life of the controller. Construction features include compact enclosure design, definite purpose disconnecting means and definite purpose emergency start handle and mechanism.

C6 fluorotelomer-derived fluorosurfactants break down in the environment to 6:2 Fluorotelomer Sulfonate (6:2FTS) that has been proven to be non-bioaccumulative – in complete contrast to PFOS.

Allows Foam Agent producers to formulate products that are rated as “Practically Non-Toxic” across the aquatic food chain.

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C6 Fluorotelomer-based foam agents have been proven many times in critical applications such as Aircraft Rescue Fire Fighting, Tank fires and Refinery fires.

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Regardless of the application, all Tornatech products provide customers with an innovative solution. Tornatech focuses all its efforts on remaining a worldwide reference in fire pump controllers by staying true to its corporate slogan "Listen-Develop-Lead". In doing so, it commits itself to delivering innovative products offering the best technical solution, superior quality supported by outstanding service.

**Booth Number: 539**

For further information, go to [www.tornatech.com](http://www.tornatech.com)

## Halotron's Clean Agent on Show

HALOTRON's Halotron I is a proven clean extinguishing agent effective on a wide range of fires. These include Class A (ordinary combustibles, wood, paper, rubber, plastics, cloth), Class B (involving flammable liquids, greases, oils, paints, solvents, alcohols, flammable gases, etc.), and Class C (involving energized electrical equipment).

Since it is a clean agent, it does not leave a residue after application, and therefore minimal or no collateral damage occurs from the agent itself to equipment and other assets in the area where it is employed. This is in contrast to dry chemical agents such as mono-ammonium phosphate (MAP), and potassium bicarbonate that generate volumes of fine particle dust that have to be cleaned up and that can be corrosive. Halotron I has undergone extensive testing and has been employed widely in portable fire extinguishers since 1994. There are now more than 1.4 million Halotron I extinguishers in service. It is discharged at a rapidly evaporating liquid, allowing for extended discharge throw lengths of 1.8 m metres to 13.7 metres.

Halotron I was approved in early 1994 for commercial/industrial and military use as a substitute for Halon 1211 in streaming applications by the U.S. Environmental Protection Agency (EPA) in its Significant New Alternatives Policy (SNAP) program.

**Booth Number: 1338**

For further information, go to [www.halotron.com](http://www.halotron.com)

## Firetrace Unveils UL Listed E4 Total Flooding System

FIRETRACE INTERNATIONAL, will be unveiling its advanced E<sup>4</sup> engineered clean agent total flooding system that has earned the distinguished Underwriters Laboratories (UL) Listing.

E<sup>4</sup> delivers a host of substantial and measurable performance enhancements when compared with traditional clean agent total flooding systems.

These include superior performance, greater flexibility, improved value, speedier installation and a measurable competitive edge for system installers.

E<sup>4</sup> systems can be safely pressurised to 500psi (34.5 bar) in low pressure hardware, thanks to the properties of 3M Novec 1230. The increased pressurisation enables incredible performance gains. E<sup>4</sup> offers greater design flexibility and lower overall hardware and installation costs, delivers a dramatic increase in both vertical and horizontal cylinder-to-nozzle distances when compared with traditional clean agent total flooding systems. They also use between 25 percent and 40 percent less piping and provide 700 percent-plus liquid agent-to-pipe volumes – the largest networks possible without the need for expensive supplemental nitrogen drivers.

Systems are available in eight cylinder sizes with fill volumes ranging from 4 kg to 590 kg, with the 590 kg cylinder being the largest single-unit fire suppression system in the industry.

**Booth Number: 739**

For further information, go to [www.firetrace.com](http://www.firetrace.com)



## Seismic Expansion Loop from Metraflex Offers More



The METRAFLEX COMPANY's Fireloop seismic expansion loop is now available to compensate for even greater pipe movements, including  $\pm 102$  mm,  $\pm 203$  mm and  $\pm 610$  mm, helping engineers and

contractors compensate for even greater pipe movement in fire sprinkler systems. The Fireloop seismic expansion joint meets all NFPA 13 guidelines for seismic expansion joints in fire sprinkler systems and is UL Listed.

An extremely flexible seismic expansion joint, the Fireloop expansion joint is quick to install, requiring only one hanger and two connections. It has low pressure drop, significantly lower than any other seismic joints for fire sprinkler systems, and is extremely thin and compact, allowing it to fit snugly into tight pipe runs, minimising impact on architectural and engineering designs.

The Fireloop expansion joint is capable of movement in all directions and should be installed anywhere building or pipe movement is expected, including seismic, thermal growth and building settlement.

**Booth Number: 2058**

For further information, go to [www.metralfire.com](http://www.metralfire.com)



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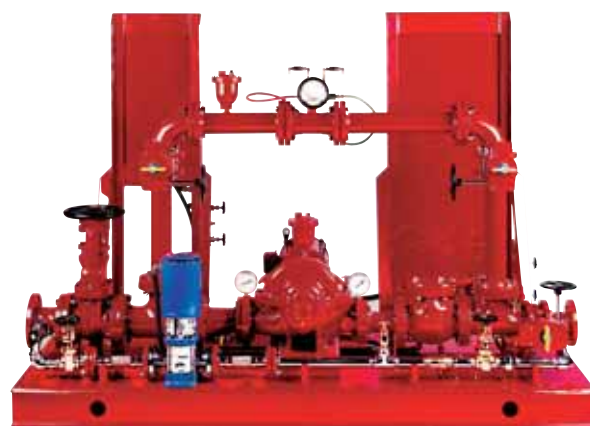
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Offering both electric and diesel drives, we can also supply complete packaged systems to custom fit your requirements.

**Contact us today and see what we can do for you.**

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# Credit Where Credit is Due



**Suzanne Donovan**

Chubb Fire & Security

According to the latest Fire Statistics issued by the U.K. Department for Communities and Local Government, fire and rescue authorities attended 154,000 fires in England between April 2012 and March 2013. This is 31 percent fewer fires than in the same period the year prior. In addition, there were 14 percent fewer fire-related fatalities during this same period. While this reduction is unquestionably good news for the population at large, the official figures only record those incidents that municipal fire services have been called upon to intervene. The statistics do not record the thousands of smaller fires that start every year and are personally managed through the use of a fire extinguisher.

**P**ortable fire extinguishers have long been the unsung heroes of the firefighting world. According to industry surveys, fire extinguishers fight more fires each year than municipal fire services. These extinguishers prevent small fires from developing into major conflagrations, yet this rarely makes the headlines.

Without continuous and robust reporting on the actual use of fire extinguishers on small fires, it is unlikely there will ever be a complete report on fire statistics. And without a complete report, safety regulators, law enforcement officials and employers may not be able to make fully informed choices about effective fire precautions for the workplace. Thankfully, industry experts bring this knowledge to the table in the development of British Standards and other industry guidance.







In late 2012, the British Standard (BS5306-Part 8) for the selection and positioning of portable fire extinguishers was considerably revised and updated. It was reviewed after some 12 years to align with the Regulatory Reform (Fire Safety) Order 2005, the Fire (Safety) Scotland Regulations 2006, and other applicable codes and standards including the extinguisher maintenance standard BS5306: part 3: 2009.

The Part 8 standard is important in many ways, not least because it recognises the use of the

extinguisher as a tool to keep routes clear and assist with building evacuation, as well as fighting fires. It also brings clarity in areas that have previously been somewhat vague, such as the definition of a storey, which is now defined as a floor or level within a building including basements, mezzanine and ground floor.

Although voluntary – in effect a Code of Practice rather than a mandatory undertaking – the standard makes a series of very important recommendations. Two of the most important recommendations relate to the siting of extinguishers to ensure quick access to an appropriate device. Distance – or more specifically, the distance an individual may need to travel to reach an extinguisher – is a key issue. An extinguisher should be placed near the fire hazard but not too close that it becomes inaccessible or puts the operator at risk. In addition, if access to an extinguisher requires the user to pass through a door, the travel distance to the extinguisher needs to be reduced.

The other important recommendation is for the installer to ensure that the appropriate fire extinguisher is placed next to the associated risk. For example, businesses should position a Class F extinguisher no further than ten meters from a kitchen facility, which uses cooking oils (olive oil, maize oil, etc.) and fats (such as butter and lard).

						
	Fires involving freely burning materials. For example wood, paper, textiles and carbonaceous materials	Fires involving flammable liquids. For example petrol and spirits, ALCOHOL OR COOKING OIL	Fires involving flammable gases. For example butane and propane	Fires involving flammable metals. For example magnesium and lithium	Fires involving electrical equipment. For example photocopiers, fax machines and computers	Fires involving cooking oil and fat. For example olive oil, maize oil, lard and butter
<b>Travel distances</b>	30m	10m	30m	case by case	10m	10m

<b>Clause 8.2; Class A Fires</b>	Each storey with an area less than or equal to 400m <sup>2</sup> should have at least 2 extinguishers having a minimum total fire rating of 26A (e.g. minimum 2 x 3L Hydrospray or 2 x 9L foam)
	For any storey with a floor area exceeding 400m <sup>2</sup> there should be at least 2 extinguishers with an A rating; having a combined minimum total fire rating of 0.065 x floor area of the storey (in square metres)
<b>Clause 8.3; Class B Fires</b>	Running fire, use Powder
	Contained fire, use Foam
	Cooking media in liquid form is NOT class B
	For open topped container: Obtain the surface area measurement in m <sup>2</sup> Use Table 1 to determine number and rating of extinguishers required
<b>Clause 8.4; Class C Fires</b>	Personnel that are required to use extinguishers for Class C fires need to be trained
<b>Clause 8.6; Class F Fires</b>	Only Class F extinguishers should be sited in areas with cooking oils or fats
	Use Table 2 to determine number and rating of extinguishers required
<b>Electrical Hazard Only</b>	Non conductive media, such as CO <sub>2</sub> powder or other clean agents, should be specified for use on electrical equipment

From a product perspective, the standard recommends that powder-based extinguishers should generally not be specified for indoor use unless mitigated by an health and safety assessment, due to sudden visibility loss when discharged, potentially preventing safe evacuation. Class F extinguishers are now required to cover fire risks involving cooking oils and fat, in preference to a fire blanket or other types of extinguishers.

## Ensuring Extinguishers Stay in the Correct Location

The standard also provides recommendations on extinguisher signage and protection against vandalism. The position and type of fire extinguisher should be indicated on a sign so that if an extinguisher is removed from its mounting, it can be more easily identified and replaced during a safety inspection.

Unfortunately, the sight of an empty extinguisher bracket or an extinguisher propping open a door is still too common in British workplaces. If an extinguisher has been removed from its fire point, has been used and not refilled or has been vandalised and not reported, it will not be available for use in an emergency, thus leading to the potential spread of a small fire before a working extinguisher is located. Furthermore, time spent searching for a missing or working extinguisher might slow down the building evacuation and increase the risk to life. The standard highlights that measures should be taken to reduce the possibility of an extinguisher being stolen or

vandalised by using protective boxes or covers, and/or the use of a stand with an audible alarm to signal when an extinguisher has been removed.

In relation to training, the 'competent person' (that is, the supplier) must inform the 'responsible person' (that is, the customer) of their legal obligations to train their employees in the use of extinguishers. Such training would also normally include training employees on the emergency procedures and escape routes in their workplace.

## The European Angle

Today, there is no European Standard for the installation and maintenance of extinguishers, hence the continued development of the British Standard BS 5306. While strong local standards are already in place across much of Europe in reaction to local building regulations and fire codes, industry working groups have been preparing pan-European guidance on extinguisher installation and maintenance, which could be particularly useful in countries yet to develop their own local codes.

The fire industry developed one of the very first European standards, EN3, for fire extinguisher design and manufacture. EN3 has been in place for nearly 20 years and achieved a good level of standardisation across Europe. Throughout Europe, markings of red cylinders with graphical instructions featuring standard fire classification icons help indicate the appropriate use of the extinguisher regardless of language.

While promoting standardisation, EN3 does allow for innovation and development, for example, the use of new materials and production methods. Equally, given the extensive use of extinguishers on workplace fires, much has also been learned about the practical use and handling of this life saving equipment, leading to advances in product design.

## Best-in-class Design

Today's extinguishers are a vast improvement compared with extinguishers of the past, and now feature an innovative quick release mechanism that could be used by right- or left-handed people, and an ergonomically designed handle, lever and hose grip to make the extinguishers more intuitive and easier to use. They are lighter and more manageable, while still delivering the highest performance when people or property are at risk.

Rubber grips have replaced metal on the top lever, thus improving operational comfort and reducing hand slippage and the risk of wrist injury by evenly displacing weight across the user's hand. The traditional pin that prevented the extinguisher from being discharged accidentally has also been replaced with an easy-pull clip for intuitive activation of the extinguisher.

Each of these developments – the fire-risk led approach, updated installation and maintenance standards, European codes and new design features, and of course the vital role of the fire service – contributes in some way to a safer environment.

The public, walking past extinguishers on a daily basis, does not need to know the details of such developments because the fire industry is working hard behind the scenes to help improve fire safety and aims to ensure that the right extinguisher will be in the right place when any one of us might need it.

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**See us at Firex International 17-19 June 2014  
ExCeL London - Stand U500**





# FIREX International to London



FIREX International is pulling out all the stops for the move to London as the 2014 show continues to build excitement. Taking place from 17th to 19th June at ExCeL London and showcasing the latest products and innovations, FIREX is the destination to keep up to date on legislation and attracts every professional involved in fire protection, prevention and detection. Offering a vast range of the latest thought-leadership education, alongside the best networking and products in the industry, more than 14,000 visitors are set to attend to compare and contrast a range of innovative fire safety solutions from 140-plus major manufacturers. FIREX International is the place to attend to discover and determine the future of the industry.

### Latest Products

With a true gathering of global manufacturers, FIREX International is the primary forum to view the latest products and technologies. Visitors will be able to get hands-on with products from Advanced Electronics, Apollo Fire Detectors, C-TEC, EMS Radio Fire & Security Systems, FLIR, Hochiki, Kidde, Wagner UK, Xtralis plus many more.

### FIREX Academy

The FIREX Academy will be returning with exceptional educational sessions, providing valuable advice on what is happening in the fire sector for the full duration of the show. Three seminar theatres will be present on the show floor and the free content will be available to all visitors who want to develop their knowledge in fire safety, legal implications and fire engineering.

Seminar theatres that make up the FIREX Academy, include: Expertise and Guidance theatre, Installers and Maintenance theatre and the FPA Infozone. More than 50 sessions will take place

across the three days and see influential experts discuss their experiences, impart knowledge and provide crucial industry updates to attendees.

The Expertise and Guidance Theatre will provide a high-level strategic overview of fire prevention and protection packed with the latest trends, product innovations and legislation. Covering a wide range of sectors, seminars include:

- **Social Housing Focus**

David Crowder, Business Group Manager of Fire investigation at BRE and Partner at Fire Investigations (UK) and (Global) LLP will be giving a detailed overview of '*Fire Safety Issues in Social Housing*'. A hugely important topic that continues to be discussed following the session on Lakanal House in 2013 and will talk about the safe guards that continue to be put in place to prevent similar disasters reoccurring.

- **Retail Focus**

Saba Naqshbandia, the prosecuting barrister for the infamous New Look case, will take to the stage alongside Colin Todd to lead the session '*Liabilities For The Fire Risk Assessor and*

# al 2014 moves

*Responsible Person – Get it Wrong at Your Peril!* Detailing what businesses need to be aware of and the serious implications that can happen if responsibilities are not clear.

- **Energy Focus**

James Lavendar, Fire Engineer Principal at LPCB and BRE Global will take to the stage in the Expertise & Guidance Theatre to discuss '*Understanding additional risks through the introduction of photovoltaics*'. Lavendar will present a summary of some potential fire safety hazards from involving photovoltaic (PV) systems and the potential for fire hazards associated, with renewable energy power generating systems.

The Installers and Maintainers Theatre will provide practical advice and present the latest trends, techniques and technologies for installers and maintainers in fire safety. Covering topics that must be recognised in the industry, seminars include:

- **Regulation 38**

Wilf Butcher, CEO of the ASFP will present the session '*Regulation 38 – Is this the best kept secret within building regulations*' and uncover some of the myths that surround it. A critical criteria that all new buildings must adhere to in order to be successfully fire compliant, this session will detail what architects, building inspectors and fire assessors need to take into account and the importance behind this regulation.

- **False alarms**

Derrick Hall, Head of Fire Products at Siemens will discuss how to combat false alarms and the significant impact these can have in the session '*CPR: Levels of Misinformation*'.

Within the FPA Infozone, influential industry leaders will take to the stage to discuss a variety of topical issues including timber frame fires, fire risk assessment competency requirements and business continuity planning. All taking place on the show floor of FIREX International, these master classes will feature leading industry speakers, including:

- **Necker Island Fire Investigation**

John Williamson, Director, UK Fire Skills will discuss the infamous Necker Island fire investigation, home to one of Britain's most famous entrepreneurs, Sir Richard Branson. Williamson will present an overview of the investigation following the Necker Island fire of 2011, the subsequent rebuilding of the Great House, its new fire safety features and the lessons learnt.

- **Challenges of International Fire Safety**

Fiona Ambrose, Safety Lead Advisor, BBC, will present what measures the BBC has implemented to enhance the fire safety of their international bureaux.



- **Business & Enforcement Working Together**

Nick Coombe, from London Fire Brigade will look at how businesses should be working with their local fire authority to reduce the regulatory burden and create a more streamlined relationship.

## Speakers Corner

Taking on the famous speakers corner at Hyde Park, manufacturers will have the opportunity to present a two-minute product pitch to an awaiting crowd. A prime opportunity to shout about what makes their products unique, manufacturers will be able to convince onlookers why they should come and test out their products at the show.

## FIREX TV

Never seen before at FIREX International, a TV crew will be roaming the show floor to keep an eye out for the most exciting activities happening. Streaming live from the show floor there is no chance of missing out on the latest product launches and biggest announcements at the show.

Taking place on the 17th to 19th June 2014 at the ExCeL London, FIREX International is part of Protection & Management 2014. Protection & Management, leads the world in fire prevention, safety standards, security systems and facilities management, this series of events is a celebration of global reputation and expertise in these fields.

Taking place at London's ExCeL Exhibition and Conference Centre from 17th to 19th June 2014, Protection & Management 2014 will attract 45,000 visitors and more than 1,600 exhibitors. Featuring six co-located events – among them IFSEC International, FIREX International, Safety & Health Expo, Facilities Show, Energy & Environment Expo and Service Management Expo – there are also dedicated education Academies offering unrivalled hints and tips from industry experts all under one roof.

Register for FIREX International, for entry into the 2014 event and the shows that make up Protection & Management 2014, visit [www.firex.co.uk/fpa](http://www.firex.co.uk/fpa)

# It's Showtime at Firex

## Hochiki Europe to Showcase Latest Technology



HOCHIKI EUROPE will be demonstrating a working preview of its FIREscape+ emergency lighting system at Firex, which integrates addressable fire detection and emergency lighting technology to provide an intelligent way-finding solution that represents a step-change in how people safely evacuate buildings.

Traditional emergency lighting does not allow signs to be 'shut off', which can direct people into the path of danger. FIREscape+ addresses this by identifying where in the building the fire is taking place and communicates the safest route.

Visitors will also see working examples of both EN and UL approved fire control panels that make up the HFP fire detection system offering. The HFP range includes Hochiki's latest generation of smoke sensors that feature the company's High Performance Chamber Technology. In addition to analogue addressable and conventional systems, Hochiki will be showing products for more specialised environments, such as its marine, intrinsically safe and explosion-proof ranges, which are also compatible with the HFP system.

**Stand Number: Q600**

**For further information, go to [www.hochikieurope.com](http://www.hochikieurope.com)**

## Fulleon to Focus on New Squashni Beacon

Eaton's FULLEON business will be displaying a powerful addition to its LX range of beacons, the new Squashni Base LX Ceiling device. Incorporating LED technology and a patented optical design, the highly efficient Squashni Base LX Ceiling helps overcome the challenge of positioning visual alarm devices (VADs) in large public spaces such as

shopping centres and other commercial buildings, where high power consumption is required to achieve the necessary coverage.

Delivering a coverage volume of 15 metres, the device matches the spacing specifications for smoke and heat detectors, which can be incorporated directly into the unit as a result of its user-friendly design. This reduces the number of beacons that would ordinarily be needed in a large public space, resulting in reduced installation time. Further economies are achieved by the low current consumption of the unit. The device has been designed in accordance with the recently-enforced EN 54-23 standard.



**Stand Number: M300**

**For further information, go to [www.cooperfulleon.com](http://www.cooperfulleon.com)**

## New Linear Heat Detection from Protectowire



THE PROTECTOWIRE COMPANY is using Firex to unveil the Protectowire CTI advanced linear heat detection system that uses patented multi-criteria detection technology for the highest immunity to false alarms.

The system has digital operation with separate short circuit fault identification and provides the ability to measure and confirm the actual temperature at the alarm point to provide true confirmed temperature initiation, while alarm point identification displays the distance to an overheat or fire condition anywhere along the detector's length. The Detector is available in three select high performance jackets and five alarm temperatures ranging from 68°C to 180°C to accommodate the widest range of applications and environments.

**Stand Number: R220.**

**For further information, go to [www.protectowire.com](http://www.protectowire.com)**



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EN 54-23 Visual Alarm Devices (VADs)



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### Full Range on Show from C-TEC



C-TEC will be exhibiting its extensive range of fire detection control panels, smoke and heat detectors, call systems, induction loop amplifiers and power supplies. A host of new products will be on show and the company will be demonstrating its powerful new analogue addressable protocol, an innovative new range of EN54-23 compliant sounder beacons and its first EN54-13 compliant system offering.

C-TEC's new range of 1-8 loop ZFP touchscreen controlled addressable fire panels will also be on display in addition to the company's new ActiV smoke and heat detectors.

**Stand Number: M500.**

**For further information, go to [www.c-tec.co.uk](http://www.c-tec.co.uk)**

### BRE Global at Firex



Independent third-party organisation BRE GLOBAL, based in the UK and with representative offices in China, India and Malaysia, will be showcasing its offering of certification of fire, security and sustainability products and services to an international market. LPCB – accepted worldwide – is the certification brand used for fire and security products and services and its listings can be accessed, free of charge, at [www.redbooklive.com](http://www.redbooklive.com) or via apps from Apple, Google and Windows.

BRE Global is also involved in the Firex Academy: and additionally carries out training, fire risk assessment, research and fire safety engineering.

**Stand Number: R100 (Red Book Pavilion)**

**For further information, go to [www.bre.co.uk](http://www.bre.co.uk)**

### Polyseam to Reveal Newly Branded Protecta Range

Sealants and adhesives manufacturer, POLYSEAM, will be unveiling the fresh branding and new additions to the Protecta range of passive fire protection products.

The company will also be announcing which are the latest products in the range to be awarded CE marking. There are already a number of products in the range that bear the CE mark, including the company's three core products EX Mortar, FR Acrylic and FR Board.

**Stand Number: Q775**

**For further information, go to [www.protecta.no](http://www.protecta.no)**

### FSi Highlights Compartmentation Systems Offering

FSi will be using Firex to provide customers, clients, suppliers and even competitors a chance to meet FSi and learn more of what it can offer.

The evolution of FSi from the previous name, Firestopit, in November was caused by the ever growing list of products and services FSi Limited can offer the industry. From consultancy services to in house testing, FSi can offer a tailor made service that is second to none. The company can aid you throughout the whole design and development of a system, give you the ability to perfect it within its indicative test furnace, and offer the manufacturing facility and technical back for the product in the future. This caused the tag line 'Develop, Manufacture, Protect' to be adopted by FSi; it describes the breadth of services it can offer to the construction industry, not just in passive fire protection but in compartmentation, protecting against the elements.

**Stand Number: R800**

**For further information, go to [www.fsiltld.com](http://www.fsiltld.com)**

### FSL to Unveil Latest Offering

FSL will be showcasing its latest products and innovations, marking one year of trading for the company, which officially launched at last year's Firex.

Taking centre stage on FSL's stand will be the company's latest product – the FSL CG<sup>4</sup> engineered system with 3M Novec 1230. As a clean agent chemical gaseous fire protection system, its highly efficient and fast extinguishing time reduces downtime and helps maintain business continuity. It is available in cylinder sizes ranging from 15 litres through to 490 litres, with four sizes of cylinder valve, including the market leading 100mm.

Also on display is FSL's recently introduced range of internationally approved fire detection panels and alarm devices, which allows the company to provide a comprehensive and end-to-end life safety system. The FSL fire detection range includes addressable and conventional technologies that are complemented with audible and visual warning devices. The control panels are available in one and two loop, and two and four

loop variants and monitor the detection devices, manage system functions including sounders and signalling, as well as providing power and battery back-up.

**Stand Number: P300**

For further information, go to [www.firetec-systems.com](http://www.firetec-systems.com)

## Firetrace Unveils UL Listed E<sup>4</sup> Total Flooding System



FIRETRACE INTERNATIONAL, will be unveiling its advanced E<sup>4</sup> engineered clean agent total flooding system that has earned the distinguished Underwriters Laboratories (UL) Listing.

E<sup>4</sup> delivers a host of substantial and measurable performance enhancements when compared with traditional clean agent total flooding systems. These include superior performance, greater flexibility, improved value, speedier installation and a measurable competitive edge for system installers.

E<sup>4</sup> systems can be safely pressurised to 500psi (34.5 bar) in low pressure hardware, thanks to the properties of 3M Novec 1230. The increased pressurisation enables incredible performance gains. E<sup>4</sup> offers greater design flexibility and lower overall hardware and installation costs, delivers a dramatic increase in both vertical and horizontal cylinder-to-nozzle distances when compared with traditional clean agent total flooding systems. They also use between 25 percent and 40 percent less piping and provide 700 percent-plus liquid agent-to-pipe volumes – the largest networks possible without the need for expensive supplemental nitrogen drivers.

Systems are available in eight cylinder sizes with fill volumes ranging from 8 lbs (4 kg) to 1,300 lbs (590 kg), with the 1,300 lb cylinder being the largest single-unit fire suppression system in the industry.

**Stand Number: R400**

For further information, go to [www.firetrace.com](http://www.firetrace.com)

## Fire Stopping Solutions from Astroflame Fireseals

ASTROFLAME FIRESEALS will be focusing visitors' attention on its comprehensive range of fire stopping products for use in walls, floors, ceilings, doors, ducts and other fire rated compartmentation structures. With fire doors playing an ever increasing part in compartmentation issues, the company will be



focusing attention on several products including fire rated air transfer grilles, drop down acoustic seals, fire rated letterboxes and door viewers.

All Astroflame Fireseals products are tested to the relevant BS, EN or third-party approvals both internationally and locally in country specific markets. This year the company has already launched a number of CE marked fire stopping products with several more to follow in the coming months.

**Stand Number:**

For further information, go to [www.astroflame.com](http://www.astroflame.com)

## Fast Detection from Honeywell



HONEYWELL will be demonstrating the latest FAAST next-generation aspiration detection technologies at Firex.

Live product demonstrations will showcase the ultra-sensitive EN54-20 approved FAAST XM device achieving false alarm immunity via unique patented technologies. FAAST LT will be demonstrated as a flexible solution for challenging applications. The latest new addition to the FAAST aspiration detection technology range being introduced at the show is FAAST XL, a high sensitivity four-channel device offering class-leading leading levels of false alarm immunity, extensive coverage and integrated communications.

FAAST next generation aspiration detectors were launched in Europe two years ago and are increasing their market share due to their ability to provide the earliest warning detection with false alarm immunity in the most challenging environments.

**Stand Number: N625**

For further information, go to [www.systemsensor.com](http://www.systemsensor.com)



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High compressive and flexural strength

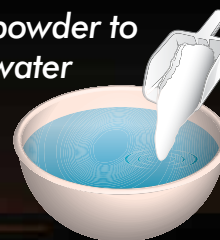
### Tested & Approved to...

- EN1366-3 2009
- BS476 p20, 1987
- ASTM E814

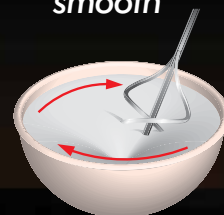


### ▶ Easy Preparation & Application...

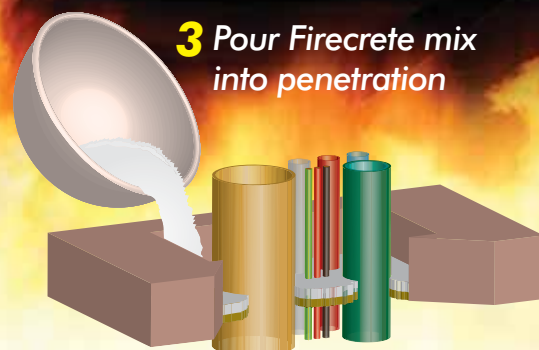
**1** Add Firecrete powder to water



**2** Mix until smooth



**3** Pour Firecrete mix into penetration



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# Keep to Performance-Based Approach for Safety



**Bob Glendenning**

Sherwin-Williams  
Protective & Marine  
Coatings

Modern design techniques offer advanced structural fire engineering and modelling that can benefit all concerned, with accurate prediction of the performance of steel for today's modern buildings and the fire performance measures required to protect them. However, over-assumptions to save costs can result in compromised fire protection.

In scoping out designs for today's modern complex buildings in our cities and where large numbers of people move about, design engineers have a host of considerations to take into account. The principle material used today is steel – now one of the key elements of any new building design – often due to the loads members can bear such as long span beams that require both strength and serviceability considerations.

With these parts of the building infrastructure already designed and prescribed, the fire engineer working with the designer can then advise on the most effective level of fire protection. Traditional 'prescriptive' approaches use pre-defined limiting steel temperatures based on the individual parts of the steel structure, usually following recognised codes of practice. These limiting temperatures are

agreed in codes of practice with conservative calculations of maximum loads to ensure the relative passive fire protection – including intumescent coatings that offer resistance to fire – is more than adequate.

Some of those in the supply chain may question why these steel parts – whether a beam, column or brace for example – would be overly-specified and under-utilised in terms of their load bearing capacity in their ambient design state. In reality, this performance-based approach allows designers to account for different applied loads being used in various parts of a building for a diverse set of reasons rather than the 'one-size-fits-all' prescriptive approach, which assumes loads and tolerance. The trend to assume loads well under the reality of performance-based modelling on each section of



steel in today's complex buildings – thus creating savings for the project in fire protection – is dangerous indeed.

For intumescent coatings, any compromise of the thickness could severely affect the level of fire protection where a steel section may carry a higher load than was allowed for by the fire protection expert and collapse under stress when subjected to a real fire as the section properties change. The risk of collapse is relative to how far the original assessment has been made below the real applied loads – and with the subsequent protection also reduced accordingly – this type of scenario offers little reassurance of what will happen in reality and is unsafe.

It is more time-consuming – but still potentially cost-saving for the project – to apply accurate calculations of each key section of a building but much safer for all concerned including the building owners or managers, who are liable in the UK, for example, under the Regulatory Reform (Fire Safety) Order 2005.

In principle, if these separate steel sections are under-utilised in all calculations, they should be safe in a real fire where adequate fire protection has been designed and applied. This guarantees safety and strength of the steel and of the fire protection coating, which enables fire safety services to enter a building, read the fire alarm data and enact a safe evacuation of any occupants from the building.

The potential level of savings when structural fire engineering is used genuinely can still be worthwhile – and more importantly safe. As examples, using 75 percent ambient utilisation of the steel beams only, with columns and brace sections remaining at 100 percent, there are savings at relevant levels depending on the scale of the project. In reality, a single level of utilisation throughout is not seen but for demonstration purposes this has been adopted here.

For a project specifying 60-minutes of fire resistance to building design code BS5950-8, the thicknesses of the intumescent coating are generally low, so an assumption of 75 percent has reduced the total theoretical volume required by nine percent from 27,300 litres to 25,000 litres. Further savings can be made, for example, where a project requires 90 minutes of fire resistance to a building designed to Eurocode 3 & 4 (1993-1-2 and 1994-1-2 for fire design). Here the thicknesses are more

## New Level in Fire Design Estimation

Software in the new Firetex Design Estimator 2.0 offers the capability of providing calculations for a vast range of steel sections as well as all shapes of apertures within cellular beams as well as efficient handling of unfilled voids with trapezoidal profiled metal decking systems. Other benefits include project sharing and guidance to all emerging Eurocode Design, independently tested and fully verified under the Exova Certifire scheme and, in the case of cellular and fire engineered beams, further verified by the University of Manchester.

The estimation and design tool also provides support where a limiting temperature has been specified (i.e. for use with Performance Based Structural Fire Engineering), removing any assumptions from all parties. Additional features offer the user the option of tailoring settings to their bespoke requirements and the ability to choose the countries and product design codes they wish to use. Ongoing guidance and support on all legislative and industry changes are made available through a web download to ensure the user is always up to date with current codes, Firetex products and software versions.

significant and savings are higher at 17 percent, with a reduced volume from 58,000 litres to 48,000 litres. When achieved as a result of genuine, professionally practised fire engineering, this could result in thickness reductions of hundreds of microns.

For a further project example, where thickness ratings are near the highest available, with 120-minute fire resistance to building design code BS5950-8, the savings rise again at 23 percent, falling from 46,000 litres to 35,300 litres. This demonstrates how, using modern fire protection design, savings can be made when used professionally and can play a major part in delivering a safe, cost-effective project.

It is the responsibility of the fire protection expert to establish the correct level of steel ambient utilisation and with it the appropriate level of protection. Working with designers, the fire performance expert can then agree the safe level of protection necessary for the sake of lives and property.

IFP

**Bob Glendenning** is Manager, Fire Engineering and Estimation, at Sherwin-Williams Protective & Marine Coatings, Europe, Middle East & Africa (EMEA)

For further information, go to [www.sherwin-williams.com/protectiveEMEA](http://www.sherwin-williams.com/protectiveEMEA)





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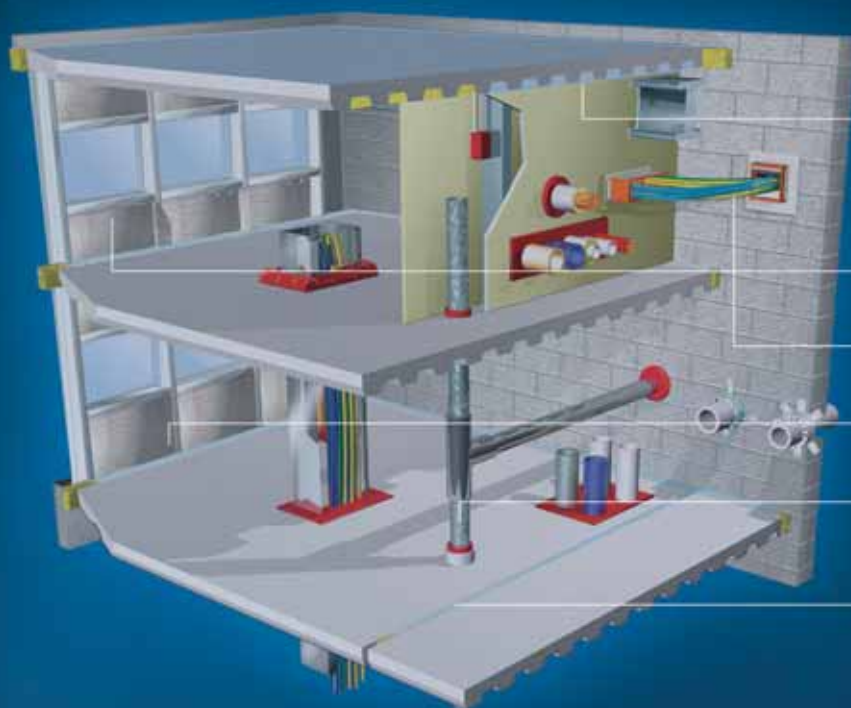
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## Fire Protection of Structural Steelwork



**Chris Miles**

UL

As the use of intumescent coatings to protect structural steelwork from the effects of fire in buildings grows the understanding of the technology and its correct use needs to intensify.

**T**here are many aspects to a well-developed fire protection industry; both 'passive' and 'active' measures are often used to provide a holistically, fire safe building. One product which seems to cross over the artificial divide between passive and active products is intumescent coatings, normally considered part of the passive fire protection industry. One simple definition of 'passive' products is that they remain inactive in a fire situation, however intumescent coatings actually become active and 'intumesce' to provide an insulating char to the steelwork they are intended to protect.

Intumescent protection is being increasingly used to fire protect structural steelwork in new and refurbished buildings due to the low thicknesses and decorative nature of the product. In common with other types of fire proofing, specification and application requires care to ensure the

intended fire safety will be provided.

With the growth in the use and availability of intumescent products it is important that the understanding of the products increases along a similar scale. These are specialist products and should be specified and applied by those who have a thorough understanding of the product's needs. Furthermore, and in common with all fire protection products, it is important that the suitability of the tests that the products were evaluated against is appropriate to the building codes to which the building has been constructed or refurbished. There are many possible test methods under which the products may have been tested and a number of post-test evaluation methods also available. A comparison must be made between what the respective building code requires and what test standard has been used to evaluate the products.



There have been many anecdotal examples where the incorrect test method has apparently been used to justify use against an alternative test standard. This is often the case with American and European test Standards that require different testing methods and these two test methods cannot be interchanged.

A final consideration, once the appropriateness of the test standard is addressed, is to ensure that the information submitted by the manufacturer is independently verified and ideally covered under a third-party certification scheme that is verifiable online. This ensures that the submitted data cannot be modified.

For many years UL has been at the forefront of testing and certifying fire resistive products and constructions to ensure fire safety of buildings, occupants and first responders. These evaluations include initial tests of fire resistance performance in accordance with ANSI/UL 263, *Fire Tests of Building Construction and Materials* (also commonly referenced ASTM E119) and long term durability. In addition, UL certifications in common with the requirements of third-party certification schemes, involve a follow up program to assist manufacturers in assuring that the manufactured product remains unchanged from the products tested and originally certified. As a result, the UL certification scheme and the associated UL Mark are recognised internationally as an independent product certification that covers reliably manufactured products.

The most relevant of the UL design guide information for fire resistive construction is found within the printed UL Directory and UL's Online Certification Directory under Fire Resistance Ratings (BXUV) Guide Information section. This is a comprehensive summary of information relevant to the application of UL 263 fire testing results. There are a wide variety of different fire resistive products evaluated to UL 263 (including boards, sprayed fire resistant materials, wraps and mastic and intumescent coatings). It also covers a wide range of construction groups, such as flooring-ceiling assemblies, roof-ceiling assemblies and vertical partitions as well as structural elements.

This article specifically focusses on fire resistive intumescent coatings for use with structural steel members. Intumescent coatings are a family of coatings that provide fire resistance to a steel substrate such that the steel may maintain its structural integrity for the duration of the fire rating. They contain certain ingredients which, in a fire situation, cause the coating to bubble and swell. This swelling process provides an insulating

**Intumescent protection is being increasingly used to fire protect structural steelwork in new and refurbished buildings due to the low thicknesses and decorative nature of the product. In common with other types of fire proofing, specification and application requires care to ensure the intended fire safety will be provided.**

At a recent industry meeting in Chicago, USA, there were lengthy discussions between the full range of industry stakeholders, including representatives of the Authorities Having Jurisdiction (AHJ) community, manufacturers of mastic and intumescent coatings, and personnel from UL (formerly known as Underwriters Laboratories) regarding the interpretation of fire resistive construction listings and the relevant design information that generally covers those constructions.

This article discusses a few of the topics addressed at the meeting and highlights the importance of following specifications and guidance that has been established for specific fire resistive materials based on years of testing and evaluations. In addition this article intends to bring clarity and guidance to some inconsistencies in how listings, particularly those under UL's certification, are interpreted within certain markets.

layer that protects the substrate from the effects of fire exposure for a specified period of time. There are hundreds of separate designs within UL's product category for mastic and intumescent coatings (CDWZ) from approximately 20 manufacturers, all of which are listed on the UL website.

The BXUV guide information does make some statements about these coatings that are worth emphasising and further explaining. Firstly, it states that: *"The mastic and intumescent coating average thickness should not exceed the maximum thickness published in the individual designs"*.

This is a very important statement, as it covers a number of possible scenarios. A product may be tested at a higher maximum thickness for a listing for columns (X series designs) than would be used on a listing for beam (N series designs) or a listing for a floor assembly (D series designs). Mastic and intumescent coatings should not be used on





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beams at film thicknesses beyond the maximum assessed for a horizontal design (for example, beam or floor-ceiling), as the material has not been tested under load at such high thicknesses.

The intumescence process results in foam that has material properties different from the unreacted, virgin material. It is imperative that a specified thickness is within the range of thicknesses on the listing for any given configuration (that is, size, shape and orientation) of steel member. Evidence has shown that it is not always safe to extrapolate a loading beyond the maximum tested and assessed value. Although in some cases this may work, in many cases this extrapolation will not be conservative. In extreme cases, adding extra thickness to the bottom flange of a beam may actually result in a situation where the intumescent foam is unable to support its own weight, delamination or excess cracking may occur and a poorer level of fire performance may be achieved.

A second statement, reproduced below, within the BXUV guide information addresses column designs relative to W/D ratio, where W is the weight of the beam per lineal foot and D is the perimeter of protection material at the interface between the steel section and the protection material: *“The minimum column size and configuration of the steel member is specified in the (X and Y series) designs. The same hourly rating applies when a steel section with an equal or greater W/D is substituted for the specified column size of the same configuration”.*

A similar statement is also present to cover beam designs. The above statement indicates that it is possible to cover a larger steel section that has a greater heat sink than the lowest W/D listed steel section, by using the minimum listed loading, without any reduction. This approach is conservative and has been generally accepted. However, the application using a thickness specified for a larger steel section to cover a smaller steel section that has a lower W/D than is listed is not acceptable, as the section will likely be under-protected. Increasing the

dry film thickness of the fire protection is an unknown, and as explained above, this does not always provide the extra protection required. Consequently, this could negatively impact the system’s ability to perform as needed in a fire event.

Listings prepared by UL indicate that material thickness tables are applicable to the minimum size of steel member specified. Substitution of a steel member for a heavier weight (greater W/D) using the same specified coating thickness is acceptable, however substitution for a lighter weight (lower W/D) steel member should not take place.

Lastly, within the BXUV design guide, there is a method to calculate for alternate coating thicknesses for slender steel sections based on steel size and hourly ratings. However, this is only applicable for the use of spray-applied fire-resistive materials (UL Category CHPX); the design guide clearly states that this method cannot be used for mastics and intumescent coatings (UL Category CDWZ).

In summary, it is important to understand the allowances and limitations for products specified within certificated designs, because deviation without using proven and established methods is likely to have negative impacts on the fire resistance performance. It is also important to ensure that the correct test method has been used as the basis for the testing of the steelwork protection as stated in the respective building code.

The result is that overall building and life safety may suffer. Guidelines referenced within the UL Fire Resistance Directory have been proven by many years of testing, research, observation and study. Adjusting these guidelines without the proper technical competence and analysis is discouraged. Users of products covered by any third-party certification, including UL listings, should confirm that the ultimate end use of the product and construction is in line with that covered by the scope of the listing, as well as the relevant design guides, all of which can be accessed from the UL website.

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**Chris Miles** is Business Manager, Built Environment Division – Europe & Latin America at UL and Head of UL UK EU Notified Body for Construction Products

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# Firefighting Foam Then & Now



**Dave Pelton**

The Solberg Company

It is often said that in order to shape the future you need to look back and understand the past. A colleague of mine recently asked: "when and what was the last great innovation in firefighting foam?" I have to admit, I had to think about the question and before I could answer he stated: "Aqueous Film Forming Foam (AFFF) in the early 1960s, at a time when vacuum tubes and black-and-white television were considered advanced technology and John F. Kennedy was the U.S. President." This time period is considered the last significant innovation in firefighting foam – nearly some fifty years ago. So it got me thinking about the advancements in firefighting foam and where does the future of firefighting foams lie.

**T**he first question, of course is: what is firefighting foam?

The National Fire Protection Association (NFPA) 11 – Standard for Low, Medium and High Expansion Foam defines firefighting foam as: "... an aggregate of air-filled bubbles formed from aqueous solutions which is lower in density than flammable liquids. It is used principally to form a cohesive floating blanket on flammable and combustible liquids, and prevents or extinguishes fire by excluding air and cooling the fuel. It also prevents reignition by suppressing formation of flammable vapours. It has the property of adhering to surfaces, which provides a degree of exposure protection from adjacent fires."

Or simpler said... foam is used for the suppression of fire. Foam extinguishes flammable liquid or

combustible liquid fires in four different ways:

- Separates the flames from the fuel surface.
- Retards vapor release from the fuel surface.
- Cools the fuel surface and any surrounding metal surfaces.
- Excludes oxygen from the flammable vapours.

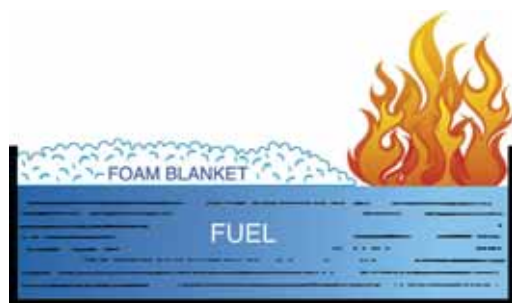
## How is Foam Made?

Finished foam is a combination of a foam concentrate, water, and air. When these three components are brought together in the proper proportions and mixed, foam is produced. The figure opposite shows how the final foam is made through a typical proportioning device.

## Characteristics of Foam

To be effective, good foam must contain the correct blend of physical characteristics:

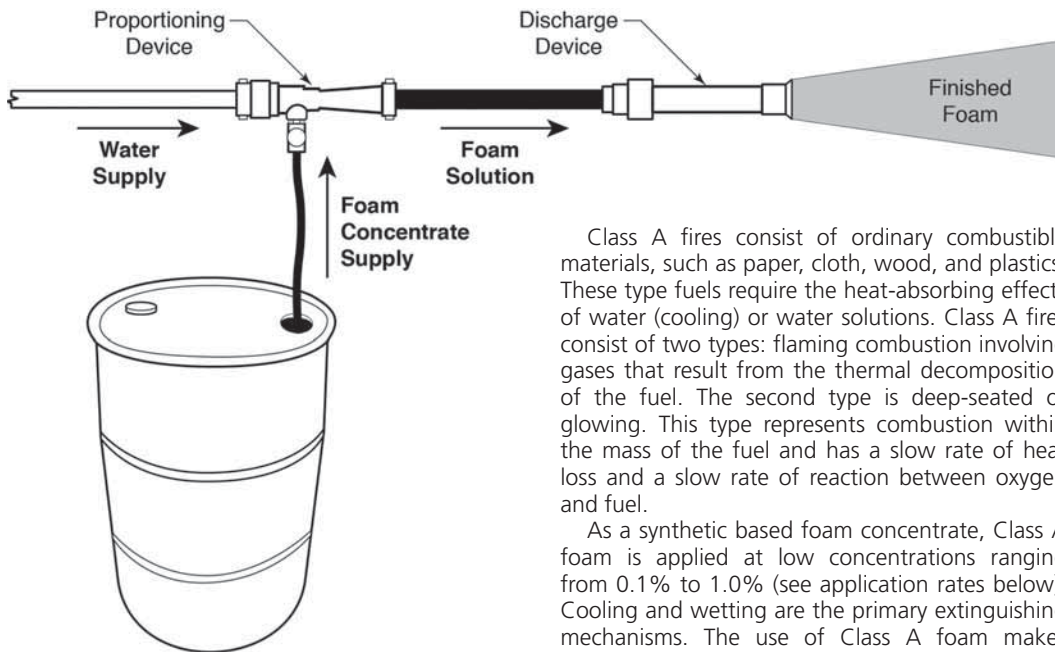
- **Knockdown Speed and Flow:** This refers to the time required for the foam blanket to spread across a fuel surface or around obstacles in order to achieve complete extinguishment.
- **Heat Resistance:** Foam must be able to resist the effects of heat from any remaining fire from the liquid's flammable vapour or heated objects.
- **Fuel Resistance:** Effective foam minimises fuel pick-up so that the foam does not become saturated and burn.
- **Vapour Suppression:** A vapour-tight blanket must be capable of suppressing the flammable vapours and minimise the rise of reigniting.
- **Alcohol Resistance:** Foam blankets are more than 90 percent water. Because of this, foam blankets that are not alcohol resistant will not last very long.



## Foam Classifications & Types

Each type of firefighting foam has its applications. Use applications range from wild-land and structural firefighting to industrial high-hazard, high-risk applications found in aviation, chemical, defense, energy, marine, mining, oil and gas, petrochemical, pharmaceutical, pipeline and solvents and coatings industries. Firefighting foams are divided into two classifications Class A and Class B.

# Advancements . . .



## Class "A" Foam

Developed in the mid-1980s, Class A foam was predominately used for wild-land fires but as its popularity grew throughout the 1990s the use of Class A foam was expanded for use on structural fires.

Class A fires consist of ordinary combustible materials, such as paper, cloth, wood, and plastics. These type fuels require the heat-absorbing effects of water (cooling) or water solutions. Class A fires consist of two types: flaming combustion involving gases that result from the thermal decomposition of the fuel. The second type is deep-seated or glowing. This type represents combustion within the mass of the fuel and has a slow rate of heat loss and a slow rate of reaction between oxygen and fuel.

As a synthetic based foam concentrate, Class A foam is applied at low concentrations ranging from 0.1% to 1.0% (see application rates below). Cooling and wetting are the primary extinguishing mechanisms. The use of Class A foam makes "water wetter" on average increasing the effectiveness of water tenfold.

**Mop-up:** 0.25%    **Initial Suppression:** 0.5%

**Fire Brake:** 0.75%    **Protection:** 1.0%

**Note:** the minimum admixture rate on other Class A fuel types are 0.1%.

These application rates make the use of Class A foam a cost effective means of combating fires

*Technicians conduct a foam burn-back test*



*Class B flouorochemical-free foam concentrate*



because smaller amounts of foam concentrate can be used to make effective foam. Class A foam is biodegradable and non-toxic, so it is environmentally sustainable. Class A foam is deployed through a variety of portable and fixed appliance devices ranging from firefighters' backpacks, brush and fire apparatus, to rotary and fixed wing aircraft.

As we look to the future, the use of and application for Class A foam will certainly advance technologically. A current example to point to is the recent generations of nozzle-aspirated induction systems and compress air foam systems (CAFS) have been more reliable than earlier generation models.

### **Class "B" Foam**

There are several types of available foams. Each foam concentrate is developed for a specific application. Some firefighting foams are thick and form a heavy, heat-resistant covering over a burning liquid surface. Other types of foams are thinner and because of that, they will spread much more quickly over the fuel surface. Still, other types of foams will generate a vapour sealing film on the surface of the fuel. Additional foam concentrate types, such as medium and high expansion foams, can be used in applications requiring large volumes to flood surfaces and fill cavities within the hazard.

- **Chemical Foams**

These foams are produced by the chemical reaction that occurs when the two chemicals, aluminium sulphate and sodium bicarbonate and mixed together. The energy required to create the foam bubbles comes from this reaction between the two chemicals. This type of foam is obsolete.

- **Protein Foams**

Protein foams are manufactured with naturally-occurring sources of protein, such as hoof and horn meal or feather meal. They are intended for use on hydrocarbon fuels only. Foam made from protein foam concentrates usually have good heat stability and resist burn-back. They must be properly aspirated and should not be

used with non-air aspirating fog nozzles. These foams are generally not as mobile or fluid on the fuel surface as other types of low expansion foams. Protein foams are susceptible to fuel pick-up, therefore, care should be taken to minimise the foam and fuel from submerging.

- **Synthetic Foams**

This type of foam concentrate is based on a mixture of surfactants and solvents, both fluorinated and fluorosurfactant/fluoropolymer-free. These types of foam concentrates may or may not form films or membranes on the fuel surface, depending on the foam concentrate and the fuel being protected.

- **Fluoroprotein Foams**

Fluoroprotein foams are a derivative of protein foams. Fluoroprotein foams have fluorochemical surfactants added. They are intended for use on hydrocarbon fuels and selected oxygenated fuels. They must be properly aspirated and should not be used with non-air aspirating fog nozzles.

### **Why Use Foam?**

Class B fires consist of flammable or combustible gases, and liquids. Extinguishment is normally accomplished by excluding (eliminating) oxygen, interrupting the combustion of the chain reaction, or stopping the release of the combustible vapours. The type of Class B hazards are either water soluble (meaning they mix with water) [for example, polar solvents] or water insoluble (meaning they will not mix with water) [for example, hydrocarbons]. For water-soluble fuels, special alcohol resistant foam agents that will not mix with the fuel are required.

Many different extinguishing agents are effective on flammable or combustible liquids. However, foam is the only extinguishing agent capable of suppressing vapours and providing visible proof of securement. Reasons to use firefighting foam include:

- **Fire Prevention:** Application of a foam blanket on an unignited spill.



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- **Vapour Suppression:** Prevention of vapours from finding an ignition source.
- **Odour Control:** Suppression of hazardous or noxious vapours.
- **Personnel Exposure:** Protection of fire and/or rescue personnel during emergency operations.
- **Asset Protection:** Pre- and post-security of the hazard until securement or removal is conducted.

Class B foam is not effective on all types of fires. It is critical to know the type of fire and fuel involved. Firefighting foam is not effective on: Class C Fires (energised electrical equipment) as water conducts electricity and foam contains 90 percent-plus water. Class C fires can be extinguished by either de-energising the equipment or using alternative extinguishing media such as dry chemical, carbon dioxide or a clean agent; pressurised gases – materials stored as liquids but are vaporous at ambient temperature. The vapour pressure for these type fuels is too high for foam to be effective; three-dimensional fires – in which the flammable liquid is being discharged from an elevated source creating a pool fire on a lower surface area; Class D fires – combustible metals such as aluminium, magnesium, potassium, sodium and titanium alloys. The extinguishment of Class D metals requires the use of specialised dry powder agents.

### Evolution of Class B Firefighting Foams

Firefighting foams have been on the market for almost 100 years in various types. Firefighting foams started with chemical foams, at each of these steps along the way, performance and safety of these various agents improved on the prior foam agent types/concentration.

**Early 1900s:** The first firefighting foams were chemical foams. They functioned by a chemical reaction from mixing two or more chemicals at the time of use, which created the foaming. More effective than water, but difficult to use and transport. Also, there was always the risk of improper mixing at the time of use.

**1930s:** Protein foams were a major improvement. They were chemically stable and effective on Class B fires. At that time, they quickly became the industry standard. Their major drawback was limited shelf life and limited storage temperatures, issues that are still problems for protein-based products today. Also, protein foams work best when they are discharged through air aspirating equipment that creates a thick foam blanket, but depending on the type of foam discharge equipment, can negatively affect the discharge range compared to non-aspirated equipment.

**1960s:** Synthetics (AFFF and AR-AFFF) entered the market. They have the ability to readily spread over a fuel surface, are very forgiving during a fire, they can be discharged through all types of nozzles, and have an extended shelf life. Fluorinated synthetic foams are the mainstay of the foam fire

protection industry, and have only recently been under review, not for their firefighting performance, but due to their environmental impact. Current synthetics are capable of extinguishing hydrocarbon and water soluble fuels, and can be discharged through air aspirating and non-aspirating nozzles, allowing maximum flexibility during use.

**Mid-1960s:** Fluoroprotein foam was introduced after the synthetics, mainly as a market response by the protein foam manufacturers. Adding fluorosurfactant to standard protein foams allowed the protein foams to more readily spread on the fuel surface. This step improved the performance of the protein based foams to somewhere between protein only foam and the fluorinated synthetics.

**2005/Present:** As environmental regulations on fluorinated synthetic foam concentrates increase around the world, a new generation of environment friendly foam concentrates is being developed. These concentrates are environmentally sustainable fluorosurfactant and fluoropolymer-free firefighting foam used to effectively extinguish Class B fuels with no environmental or toxic breakdown. They are synthetic based foam technology designed to replace traditional AFFF and AR-AFFF foam concentrates and older fluoroprotein foams.

### Summary

As I mentioned at the start of this article, firefighting foams have been used for the extinguishment of fire for almost 100 years in various types. Firefighting foams started with chemical foams, and at each of the advancement steps along the way, performance and safety of those agents improved on the prior foam concentrate type. Despite the importance and need for firefighting foam today, the last significant development efforts occurred in the 1960s with the commercialisation of AFFF for Class B foams, and the 1980s for Class A foam, now some fifty and twenty years ago respectively. So what will the future hold?

Surely the developments in induction systems for Class A foam (and perhaps the agent chemistry) will continue to advance as it has over the past decade. But as for Class B foam concentrates, agent chemistry development efforts seem to have been frozen in time with reliance on existing base technologies. Only since the introduction of environmental regulations over the past five years or so on fluorine containing AFFF's have the manufacturers of firefighting foam taken the development challenge seriously. These fluorine-free products (some first generation and others second or third generation) will continue to evolve in both agent chemistry and firefighting performance with the goal of achieving high performance on flammable and combustible liquids, improved burn-back resistance for firefighter safety and provide for many additional years of shelf life over foams derived from protein.

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**Dave Pelton** is Vice President, Global Marketing for The Solberg Company

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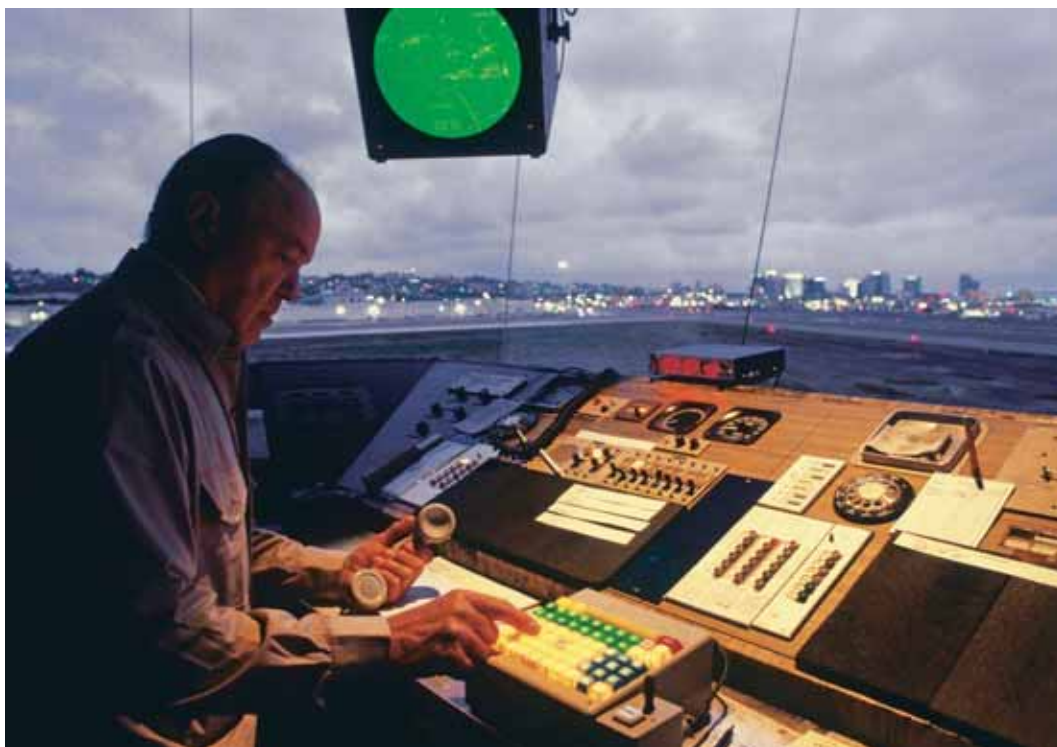
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Fluoroproducts

For more than three decades, Halon 1301 and Halon 1211 played a key role in the fire protection of airport facilities and aircraft, and they continue to provide fire protection in critical applications such as cargo bay protection. However, clean agent Halon replacements are gradually finding their way into on-board aircraft applications including engine nacelle and lavatory trash receptacle protection systems, and are ideally suited for the protection of ground-based mission critical assets.

For more than three decades, Halon 1301 ( $\text{CF}_3\text{Br}$ ) and Halon 1211 ( $\text{CF}_2\text{BrCl}$ ) have been widely employed for the protection of airport facilities and aircraft. The Halons are "clean" agents, leaving no corrosive or abrasive residues after their use, thus eliminating the secondary (non-fire) damage associated with extinguishing agents such as water, dry chemicals or foams. In addition, the Halons are non-conductors of electricity; hence they are applicable for the protection of electronic equipment. Halon 1211, characterised by a low vapour pressure, is most suitable as a streaming agent in flight-line applications and in portable extinguishers, whereas the more volatile Halon 1301 is best suited as a total flooding suppression agent for the protection of engine nacelles, auxiliary power units (APUs), cargo bays, control rooms and facilities housing mission critical equipment.

Due to their unique combination of chemical and physical properties, Halon 1301 and Halon 1211 served as nearly ideal fire suppression

agents. However, due to their implication in the destruction of stratospheric ozone, the Montreal Protocol of 1987 identified Halon 1301 and Halon 1211 as two of numerous compounds requiring limitations of use and production, and an amendment to the original Protocol resulted in the halting of Halon production on January 1, 1994.

### Clean Agent Fire Protection for Airports

Airport fire protection needs include the following:

- Control tower protection.
- Electronic control/computer room protection.
- Records storage facility protection.
- Ground incident protection.
- Flight-line protection.

Clean agents consist of two broad classes of agent: inert gas agents and halocarbon agents. Inert gas agents cannot be compressed to the liquid state, and therefore must be stored as high pressure gases. This in turn necessitates the use of high pressure storage cylinders and high pressure

# Aviation Fire

pipework for inert gas systems, adding significant cost to inert gas suppression systems. The low volumetric efficiency of the inert gas agents and their inability to be stored as liquids leads to the requirement of a large number of system cylinders compared with halocarbon systems. This in turn leads to the requirement for additional storage space and increased system footprint, adding further to the cost of inert gas systems. Due to the inherent weight and volume penalties associated with inert gas systems, their use in aviation applications is limited compared with that of halocarbon clean agent systems such as hydrofluorocarbon (HFC) systems.

The halogenated agents can be stored as liquids, allowing for a much larger mass of agent to be stored in the same volume compared with inert gases, significantly reducing the number of cylinders required with these systems compared to inert gas systems. In addition, the halocarbon agents can be stored in standard low pressure cylinders and employ standard piping.

The most widely employed clean agents in aviation applications, due to their high volumetric efficiency and low weight and volume requirements, are the HFC-based clean agents HFC-227ea (FM-200) and HFC-125 (FE-25).

## Control Tower Protection

Critical to the operation of any airport is the air control tower.

In the United States alone there are approximately 7,000 aircraft in the sky at any given time. Air traffic controllers are tasked to ensure the safe operation of commercial and private aircraft, and must coordinate the movements of thousands of aircraft during take-off, flight and landing, directing them around bad weather and ensuring that air traffic flows smoothly. The mission critical nature of control tower operation demands a fire protection system that provides rapid fire extinguishment and results in a minimum amount of downtime following a fire incident – clean agents are hence an ideal fire protection option.

The most widely employed clean agents for air control tower protection are FM-200 (HFC-227ea)



and Inergen (blend of N<sub>2</sub>, Ar, and CO<sub>2</sub>). For example, the world's tallest air control tower, located at the Kuala Lumpur Airport's new terminal (KLIA2) in Malaysia, employs FM-200 systems for the protection of numerous rooms within the air control tower structure.

## Electronic Control, Computer & Records Storage Room Protection

In addition to the air control tower, mission critical facilities within airports also include control rooms, computer rooms and record storage rooms. FM-200 and Inergen clean agent systems are widely employed in these facilities, providing both rapid fire extinguishment and minimum downtime in the event of a fire. Table 1 indicates a selection of the numerous airports worldwide employing FM-200 clean agent systems for the protection of control, computer and record storage rooms.

**Table 1. FM-200 Clean Agent Airport Installations**

Kuala Lumpur KLIA2 (Malaysia)	Barcelona Airport (Spain)
Dubai Int'l Airport (UAE)	Budget Terminal, Changi Airport
Dusseldorf Int'l Airport (Germany)	Changi Airport (Singapore)
Hanoi Int'l Airport (Vietnam)	Charles DeGaulle Airport (France)
Hong Kong Int'l Airport	Doha Int'l Airport (Qatar)
New Bangkok Int'l Airport (Thailand)	Philadelphia Int'l Airport (USA)
Phuket Airport (Thailand)	Newark Int'l Airport (USA)
Bahrain Airport (Bahrain)	San Francisco Int'l Airport (USA)



### Ground Incident Protection

Ground-level fire threats include high-speed and/or high-angle ground impact incidents, low-speed and/or shallow ground impact angles, and fire incidents involving aircraft in a landing, take-off, or taxi mode. Aircraft Rescue and Firefighting (ARFF) services employ specialised vehicles to transport rescue and firefighting personnel, equipment and extinguishing agents to the scene of aircraft accidents. NFPA 403 *Standard for Aircraft Rescue and Fire Fighting Services at Airports* contains the minimum requirements for ARFF services. NFPA 403 requires ARFF vehicles to carry one or more of AFFF, fluoroprotein foam, protein foam or fluorine-free synthetic foam as a primary agent, and to carry as a complimentary agent one or both of a potassium-based agent or a halogenated agent. In most cases the halogenated agent employed is either Halon 1301 or Halon 1211.

### Flight-line Protection

The parking area and maintenance hangars, where aircraft are on-loaded, off-loaded, and serviced, present significant fire protection challenges. In addition to foam-based systems, 68kg wheeled units of clean agents Halon 1211 or Halotron I (HCFC Blend B) are commonly employed in flight-line fire protection.

Minimum fire requirements for aircraft hangars are contained in NFPA 409 *Standard on Aircraft Hangars*. Although water-based systems such as deluge systems were employed in the past, NFPA 409 does not recognise these as viable systems. Foam-water deluge systems are now the norm for hangar protection.

### Fire Protection for Commercial Aircraft

Typical commercial aircraft fire zones equipped with fire extinguishing systems include:

- Engine nacelle and APU.
- Lavatories.
- Crew and passenger cabins.
- Cargo and baggage compartments.

### Engine Nacelle/APU

Despite the successful employment of HFC-125 by the US military in engine nacelle/APU fire protection, to date there have been no examples of the

replacement of Halon 1301 in the engine nacelle or APUs of commercial aircraft, and Federal Aviation Administration (FAA) research in this area is ongoing. A minimum performance standard (MPS) for engines and auxiliary power unit compartments has been established by the FAA in cooperation with international airworthiness authorities that seeks the current level of safety provided by Halon 1301 at 6 percent volumetric concentration throughout the protected zone for a duration of one-half second.

Past FAA testing of agents including HFC-125,  $\text{CF}_3\text{I}$ , and 2-bromo-1,1,1-trifluoro-propene (2-BTP) failed to identify a suitable Halon 1301 replacement. Recent FAA engine nacelle fire testing of a solid aerosol agent failed due to agent distribution problems, and FAA testing of a perfluoroketone agent (FK-5-1-12, Novec 1230) failed due to insufficient volatilisation of the agent at low temperatures; this same low temperature behaviour led Airbus to abandon its initial plans to replace Halon 1301 in engine nacelles/APUs with FK-5-1-12.

The inability of the commercial aircraft industry to identify a Halon 1301 replacement for engine nacelle/APU protection has led to the formation of the Engine/APU Halon Replacement Industry Consortium (IC), whose goal is to define a common non-Halon fire extinguishing solution for use in engine/APU fire zones. The IC includes airframe manufacturers, system manufacturers, airworthiness authorities and agent producers. The current IC goal is to down-select to a single agent by the end of 2015.





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**Table 2. Military Aircraft: Clean Agent Protection**

Aircraft	Fire Extinguishing System	Area Protected
F/A-18E/F Super Hornet	HFC-125	Engine nacelle/APU
	OBIGG	Dry bay; Fuel tank
F-22 Raptor	HFC-125	Engine nacelle/APU
V-22 Osprey tilt-rotor aircraft	HFC-125	Engine nacelle/APU)
	OBIGG	Dry bay; Fuel tank
H-92 helicopters	HFC-125	Engine nacelle/APU
UH-1Y helicopters	HFC-125	Engine nacelle/APU
AH-1Z helicopters	HFC-125	Engine nacelle/APU
F/A-35 Lightning II	OBIGG	Fuel tank

### Lavatories

The requirement for an automatic fire extinguishing system in aircraft lavatory trash receptacles was proposed in FAA Notice 84-5 as a consequence of two incidents. The first involved a cabin fire aboard an Air Canada flight in 1983, in which 23 people perished. The second occurred in the same year at Tampa International Airport, without injuries or loss of life.

Technically feasible alternatives for Halon 1301 have been identified and tested to the FAA's Lavatory Extinguishing Unit MPS. New production aircraft are being installed with lavatory extinguishing (lavex) systems that contain either HFC-227ea or HFC-236fa. In addition, several airlines are replacing existing Halon 1301 lavex systems with HFC-227ea or HFC-236fa systems during scheduled maintenance operations.

### Cabin Protection

FAA and international airworthiness regulations mandate that hand-held fire extinguishers be located in crew and passenger compartments. An MPS for handheld extinguishers has been established; the purpose of the MPS is to ensure that extinguishers using Halon replacement agents pose no reduction in safety, both in terms of effectiveness in fighting on-board fires and decomposition product toxicity. The MPS specifies Halon 1211 equivalency testing, a hidden fire test and a gasoline-drenched seat fire toxicity test.

Currently, no technical barriers exist to the replacement of Halon 1211 in this application, as HFC-227ea (FM-200), HFC-236fa (FE-36), and HCFC Blend B (Halotron I) systems have passed all of the tests required by the Handheld MPS. Despite this, there has been no replacement of Halon 1211 in handheld extinguishers on-board commercial aircraft.

### Cargo & Baggage Compartments

The inability of the commercial aircraft industry to identify a Halon 1301 replacement for cargo/baggage compartment protection has led to the formation of the Cargo Compartment Halon Replacement Working Group, whose goal is to define a common non-Halon fire extinguishing solution for use in cargo/baggage compartment fire zones. The working group includes airframe manufacturers, system manufacturers, airworthiness authorities and agent producers. The current working group goal is to down-select to a single agent by the end of 2015.

### Fire Protection for Military Aircraft

In contrast to the situation in the commercial aviation industry, the US military has made significant progress in replacing Halon 1301 in engine nacelle applications. Despite weight, space, and the associated cost penalties, HFC-125 has been adopted in a number of US military engine/APU applications. A Department of Defence (DOD) program has been developed that includes a design model allowing designers to calculate HFC-125 agent mass requirements for a particular engine nacelle or APU compartment. In the case of the U.S. Navy's F/A-18E/F, the mass of HFC-125 shown to meet the design challenge was found to be considerably less than that originally predicted by the DOD model.

On-board inert gas generation (OBIGG) systems have been developed and employed in military aircraft to prevent the build-up of explosive conditions in fuel tanks by generating nitrogen enriched air to lower the oxygen content in the fuel tank ullage.

Table 2 shows a selection of US military aircraft currently employing clean agents. HFC-125 is employed for engine nacelle protection in the F/A-18E/F Super Hornet, the F-22 Raptor, the V-22 Osprey tilt-rotor aircraft, and the H-92, UH-1Y and AH-1Z upgraded helicopters. Inert gas generators protect the dry bays on the V-22 Osprey and the F/A-18E/F Super Hornet. On-board inert gas generating (OBIGG) systems are employed to inert the fuel tanks of the V-22 Osprey, F/A-18E/F Super Hornet, and the F/A-35 Lightning II Joint Strike Fighter.

### Conclusion

For more than three decades, the clean agents Halon 1301 and Halon 1211 have played a key role in the fire protection of airport facilities and aircraft, and the Halons continue to provide fire protection in critical applications such as cargo bay protection where no suitable replacements have been developed. Clean agent Halon replacements, especially the HFC-based agents, are gradually finding their way into on-board aircraft applications including engine nacelle and lavatory trash receptacle protection systems, and are ideally suited for the protection of ground-based mission critical electronics in airport control towers, computer rooms and control rooms. Halon 1301 and Halon 1211 are no longer produced, and as the current Halon bank continues to shrink, the use of the clean agent Halon replacements in these demanding applications is expected to increase.

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**Mark L. Robin** is Senior Technical Services Consultant at DuPont Chemicals & Fluoroproducts

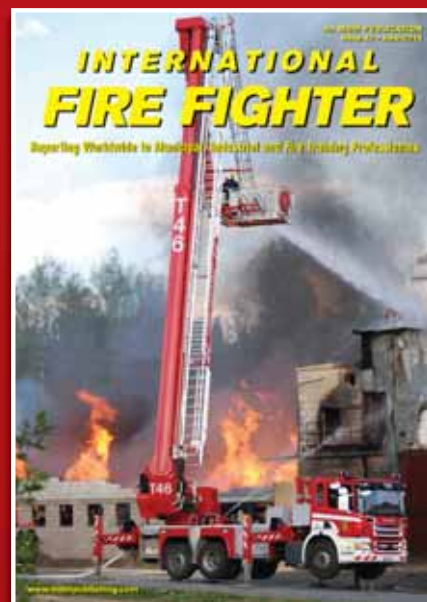
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# 20 Years Later: Halon – is it Critical?



**Ron Marcus**

A-Gas RemTec



It has been 20 years since developed countries stopped production of Halons as a clean agent fire suppressant. Where do we stand regarding its use, future availability and alternatives for critical use applications in the future?

**T**he ban on production of Halon for fire suppression in developed countries was enacted over 20 years ago on January 1, 1994. Since then, progress has been made to address alternatives for Halon for critical use but there are still numerous challenges in finding suitable alternatives. Among them are minimum agent performance standards, volume, weight requirements, systems requirements as well as meeting environmental impact requirements.

The status of the three major areas of critical use are:

### **Aerospace Industry**

The United Nations Environment Programme's Halon Technical Options Committee (HTOC) reports: "All new installations of fire extinguishing systems for engines and cargo compartments use Halon 1301, and all new installations of handheld extinguishers use Halon 1211. With the exception of lavatory trash receptacles, there has been no retrofit of Halon systems or portable extinguishers with available alternatives in the existing worldwide fleet of aircraft." With the life cycle of new equipment in aerospace industry extending over 50 years in some cases, this presents a significant challenge to all stakeholders.

With that said, the European Commission adopted cut-off and end dates for essential-use exemptions for Halon on airplanes operating in the European Union. The International Civil Aviation Organization adopted Halon replacement deadlines in 2011, and Underwriters Laboratories will withdraw its standard for Halon in handheld fire extinguishers in 2014.

The Aviation Rulemaking Committee Charter states: "Currently, Halon is utilized in four major aircraft application areas; lavatory bottles, handheld extinguishers, engine/APU nacelles, and cargo compartments. The aviation industry now relies on reserve stockpiles of Halon, supplemented by decontamination and purification processes to "recycle" Halon. While these approaches fulfil current demand for Halon, at some point in the future Halon will no longer be economically viable, and as that timeframe approaches the risk of contamination for Halon reserves is a growing safety concern."

As a counterpoint to the above comments and as part of the reclamation industry, we would suggest that contamination is not more of a risk but less of one going forward. The industry has undertaken extraordinary efforts and investment to continue to improve quality control and protect against contamination. We have worked diligently with the Halon Technical Options Committee (HTOC), Halon Alternative Resources Corporation (HARC), Halon Recycling Corporation (HRC) and have contributed information used by the Federal Aviation Administration (FAA) and the European Aviation Safety Administration (EASA) to insure compliance with ISO 7201 and ASTM D5632-08 standards. The results of which is a stringent quality control protocol designed to prevent such contamination. The industry has also made substantial investments in a continuous improvement process of both cryogenic and distillation technologies to remove any contamination. Independent laboratory testing is completed at one of three AHRI certified laboratories in the U.S. to verify results. We also

# on for Critical Use

	Requirement	Lavatory	Handheld	Propulsion/ Auxiliary Power Unit	Cargo
New Design (New Type Certification Application)	European Commission Cutoff Date	2011	2014	2014	2018
	International Civil Aviation Organization	2011	2016	2014	N/A
	Underwriters Laboratories Standard	N/A	2014	N/A	N/A
Current Production	European Commission End Date*	2020	2025	2040	2040
	International Civil Aviation Organization	2011	2016	N/A	N/A
	Underwriters Laboratories Standard	N/A	2014**	N/A	N/A

\*Includes retrofit with non-halon agent.

\*\*Last year UL agreed to extend the existing listings under 1093 until 2025. So even though the standard is withdrawn, organizations can continue to get a UL listing on existing designs of Halon 1211 extinguishers.

work with countries worldwide to address these issues to meet ISO-7201 and ASTM D 5632-08 Type I & II standards for all Halons reclaimed.

Although efforts to find effective replacements for Halon used in the aerospace industry are, in some cases, promising much work still remains as stakeholders work against diminishing supplies and a stringent timeline for a solution.

## Defence Applications

The military continue to confront the challenges faced by other critical users of Halon. "Military organisations have faced, and continue to face, significant difficulties in the replacement of Halons in a large variety of applications. They have been instrumental in the development of alternative materials and the assessment of their performance, particularly for new designs of equipment. Where possible, existing military applications have already been converted to suitable alternatives. In other cases, improved procedures, changing requirements and alternative fire protection strategies have allowed the removal of Halon without replacement by an in-kind alternative. Despite this progress, there are, still, military applications that can, and should, be converted.

There remains, however, a significant number of applications for which Halon is currently, and for the foreseeable future, the only feasible option. These are mainly in applications where personnel safety, operational capability, weight, space and fire extinguishing performance are all dominant factors. Significant resources are being devoted to finding a long-term solution to these problem areas. Until alternatives can be found, these applications are being supported by the responsible management of Halon stocks, often held at central locations, and often obtained by the recycling of materials recovered from non-critical

applications. Because of this careful management, there is not considered to be any need for future Essential Use Production Exemptions for Halons 1211 or 1301 for the military sector."

## Petrochemical Industry

In most cases, existing facilities were designed and constructed with Halon fixed systems as an integral part of the safety system design as well as the physical layout of the facility. As with civil aviation, after extensive research, it has been determined that in some cases the replacement of such systems with currently available alternatives is economically impossible, and that current research is unlikely to lead to an economic solution. Thus these facilities will likely rely on existing Halon banks for their operating lifetimes. However, in order to reduce the impact on the Halon banks, measures have been taken to reduce emissions.

## Recovery Efforts & Future Challenges

This is, in part, a simple story of supply and demand. Since production of Halon for fire protection was halted in 1994, recoverable Halon has continued to diminish as the demand for Halon for critical use has expanded.

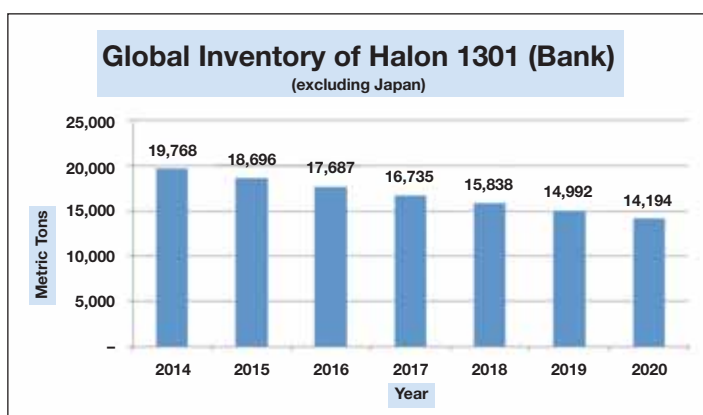
The global fleet is projected to grow over 60 percent in the period 2005 to 2020. The total quantity of Halon 1301 installed in civil aircraft is estimated to increase from about 1,800 metric tonnes in 2005 to over 2,500 metric tonnes in 2020, or a greater than 40 percent increase.

The recoverable Halons from countries allowing exports of Halon have diminished and will continue to do so. The total global inventory of Halon 1301 (excluding Japan due to prohibition of exportation of Halon) is expected to drop by 28 percent between 2014 and 2020 from 19,767 metric tonnes to 14,194 metric tonnes.

**Estimated Number of Aircraft in Service 2005 to 2020 (Excluding Russian-built aircraft)**

	2005	2010	2015	2020
Mainline Passenger Aircraft	13,784	16,078	19,172	22,265
Regional Passenger Aircraft	3,927	4,527	5,398	6,269
Mainline Freightier Aircraft	960	896	1,011	1,126
Regional Freightier Aircraft	1,007	970	1,095	1,220
<b>Total Passenger and Freightier Aircraft</b>	<b>19,678</b>	<b>22,471</b>	<b>26,676</b>	<b>30,880</b>

In addition, as supplies shrink in developed countries, the focus of recovery is increasing in developing countries, which are many times plagued with civil or political unrest as well as technical or bureaucratic obstacles. This impedes the recovery process, increasing the cost of recovery.



Finally, imports from developing countries exhibit a higher rate of contamination. Additional processing and more sophisticated equipment is required in order to return the Halon to ASTM D 5632 Type 1 or 2 or ISO- 7201-1 standards.

### Production of New Halon, if Needed

If no alternative is found, could “new” Halon be produced for critical use needs? Although the production capabilities exist, the likelihood is remote that the Montreal Protocol would issue an Essential Use Exemption for production of new Halon due to the regulatory and stakeholder approvals required.

It should be noted that “Halon 1301 (CF<sub>3</sub>Br) continues to be produced in China and France for use as a feedstock in the manufacture of the pesticide Fipronil. Production in France remains steady at approximately 400 metric tonnes a year. Production in China has varied over the past six years but is believed to be steady now. However, a current production figure was not available to the HTOC.

Under the Montreal Protocol, feedstock are considered to be controlled substances (under Articles 1 and 7, and Decisions 1/12B and VII/30), which means that feedstock are subject to many

of the provisions that apply to controlled substances in general. Parties have also been urged to minimise emissions under Decisions IV/12 and IV/24.

Halon 1301 is a useful feedstock for preparation of bioactive compounds such as Fipronil, a broad-spectrum insecticide. A new development of non-ozone depleting trifluoromethylating agent will provide an option for resolution.”

The above data was compiled from the Ozone Secretariat and reported by Parties under Article 7. The report indicates that from 2010 to 2011 alone, production increased from 900 metric tonnes to over 1,270 MT, a 41 percent increase. The point being that production of Halon 1301 as a feedstock is on-going and increasing although it is strictly prohibited for use other than as a feedstock under the Montreal Protocol. Significant consequences are attached to any misallocation of these feedstocks.

### Summary

The Fire Protection industry has made great strides in managing the transition from Halons to alternatives agents. We continue to be vigilant in our management of recovery of these ozone depleting substances. We appreciate the contribution of all stakeholders in the National Fire Protection Association in this process. As our industry continues to seek solutions for the replacement of these critical use agents, we appreciate all efforts to recover and re-allocate these agents for as long as it is required.

We would suggest that although much has been accomplished, challenges confront us going forward to insure the continued uninterrupted supply of Halon for critical use. Among those are the difficulties of recovery due to country restraints and regulatory delays. It would be of tremendous assistance if bodies such as the Montreal Protocol would increase efforts to work with its members to improve continuity and streamline the export/import process of Halon for critical use. This would enhance the supply of these agents where they are needed and improve compliance with ISO 7201 and ASTM D 5632-08 Type I & II standards. We encourage and support the streamlining of this process as the recovery of Halons for critical use increases in a variety of countries in the years to come.

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**As feedstock, Halon 1301 has been produced for this purpose in increasing amounts over the last 20 plus years**

	Metric tons	Metric tons	Metric tons	Metric tons
Feedstock data by year	1991	2000	2010	2011
Halons	–	400	900	1,270

**Ron Marcus** is Director, Business Development at A-Gas RemTec

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# ASD – Rising to the Challenges

*Aspirating smoke detection is able to distinguish between dust and smoke, even in the most demanding application*



**James Ivanovski**

Siemens Building  
Technologies Division

Everybody knows that fire always has the potential to be a real threat to both life and property. It is therefore vital to know that personnel and property are reliably and efficiently protected from its outbreak wherever possible. However, should the unthinkable happen and the circumstances come about for combustion to occur, the very least that we would all want is the assurance that we receive the earliest and most reliable detection possible.

It is generally accepted that aspirating smoke detection (ASD) is one of the technologies that provides the earliest detection of the incipient stages of combustion. Aspirating smoke detection systems – also widely known as air sampling detection systems – can detect smoke before it is even visible to the human eye. The systems generally consist of a network of independent pipes with one or more sampling apertures that actively draw air into a highly sensitive smoke-sensing chamber. There, the sampled air is precisely and accurately analysed by a scattered-light detector for smoke particles. If smoke particles beyond a pre-set threshold are detected, the system triggers an immediate alarm. In that way, a timely warning is given, along with the opportunity to fully investigate the cause of the alarm. The most appropriate response can then be initiated to stop the fire gaining a hold and thus prevent injury, damage and disruption to business.

Aspirating systems can be up to a thousand times more sensitive than a standard point detection system. By combining this level of sensitivity with an environmental learning capability, it is possible for such a system to provide and maintain the

optimum operating level and keep unwanted or 'false' alarms to an absolute minimum – without external input. Aspirating systems also usually have the capability to monitor their own integrity and, in the event of the system's ability to detect smoke being compromised for any reason, an alert is raised. Conventional point detection usually comprises passive devices that are simply constantly monitored. The systems have no ability to determine whether any occurring smoke will actually reach the detectors.

### **An Alternative with so Many Applications**

Aspirating smoke detection is no longer a new technology, having been tried and proven in many different applications. Nor is it simply an alternative option to standard point detection, which is generally more than suitable for most standard applications where cost and basic compliance to regulations are often the main selection criteria. Aspirating detection is still very widely used within IT and telecommunications environments – the arena for which it was originally developed – protecting highly ventilated areas such as data

# Most Demanding

centres, information technology and computer centres, telecommunication facilities, laboratory and research centres, electronic measuring rooms, transformer rooms and clean rooms.

In these mission-critical facilities, high power loads and minor deficiencies in the electrical equipment can lead to short circuits or dangerous overheating. However the dilution of any resulting smoke and any redirection of it by the vigorous airflow would most likely prevent any signals of combustion from reaching conventional detectors in adequate time or in sufficient quantities to trigger an alarm. In the event of a substantial fire breaking out, the potential loss in either a data centre or server room might not be just the important or irreplaceable data they hold, but also the significant revenue for its safe storage along with the IT company's reputation.

## Release of Gaseous Extinguishants

In these IT areas, such as electrical control rooms, substations, computer, server and telecommunication rooms, wherever gaseous extinguishing systems are employed, codes of practice now call for two levels of detection before the release of extinguishants. This "coincidence" or "double-knock" protection as it is known can utilise two independent detection systems: designed for one to confirm the other (double-knock).

## High Power & Heavy Ventilation

However, it is not just IT environments that are heavily ventilated these days. Many buildings today are served by close-control air conditioning systems that operate with high-velocity airflows. These strong currents can effectively prevent any smoke generated in the first stages of a fire from reaching conventional detectors. This is particularly true of the incipient stages of combustion when "cool" smoke lacks the thermal lift to rise to the ceiling where smoke detectors are traditionally sited. Installers of aspirating systems can overcome these problems by siting the sampling apertures of the pipework within the airflow produced by the air-conditioning units, usually with most effect in front of the intake grill or duct for expelled air. In this way the quickest and most certain of responses is generally assured.

## Detection under Difficult Conditions

Aspirating smoke detection systems are ultra-sensitive, quiet and unobtrusive – qualities that make them suited to a multitude of applications and there are now many other applications, environments and conditions where today's prevailing considerations make aspirating detection a more viable and effective option than standard point detection. As well as affording the earliest warning, aspirating detection systems are also particularly suited wherever environmentally challenging conditions prevail, limiting the effectiveness of standard detectors.



*For historical buildings, where an aesthetically appealing solution and high detection sensibility are needed, ASD is the ideal solution*

There are applications where conditions are extremely hot or cold, wet or dusty. There are places with unusual or hard-to-access areas like intermediate ceilings, raised floors, cable ducts, distribution cabinets and display cases. Unlike traditional point detection systems, the detection units of aspirating systems do not need to be situated in the protected area. Only the sampling pipes are located within the area, continuously extracting air and carrying it to the detection chamber for analysis. This makes aspirating systems ideal for use in applications traditionally difficult to protect with conventional detectors such as textile drying areas, tobacco plants, cold stores and food preparation areas.

The ability of most systems to filter out dust particles completely enables them to perform highly effectively in even the dustiest locations while still keeping unwanted alarms to a minimum. This means that they can even be installed for use in recycling facilities, paper and flour mills, coal conveyors, wood recyclers, cable tunnels and textile areas.

## Even Greater Reliability

Providing the earliest warning in harsh environments coupled with absolute reliability, however, is still a real challenge, but there are now available aspirating smoke detectors that can distinguish between smoke and dust – even in the most demanding application areas.

In the past, even for aspirating systems, differentiating between airborne particles of smoke, dust and steam has led to the generation of too many unwanted alarms. Now, new models of aspirating detector combine optical dual-wavelength technology with patented proprietary detection chamber technology. The new optical technology utilises light of two differing wavelengths. This enables the detection of the smaller airborne particles produced in the earliest stages of overheating or open flame. By determining the exact size and concentration of the actual airborne particles, the detectors are able to distinguish between smoke,



*In data centres, smoke dilution and redirection because of high ventilation can mean that smoke cannot reach a conventional detector fast enough*



dust and steam. As a result of this analysis, they are able to detect smoke in the very early stages of combustion reliably – with a high immunity to other deceptive phenomena. Such early, accurate and reliable detection – that is largely immune to external interference – can eliminate the downtime and resulting costs of unwanted or false alarms caused by steam, dust and other misleading airborne conditions of hostile environments.

Some of the new models can provide up to three modes of operation, such as: 'ultrasensitive', 'auto-discrimination' and 'robust'. Depending on the application, it is possible to choose between ten different parameter sets. To make sure the extinguishing is triggered at a higher obscuration level, a separate parameter set is available for this purpose. The new detectors are easy to install and their integration into existing systems is also possible in order to ensure full transparency of both even display and operation. Integration makes it possible to configure the detectors, perform maintenance work and handle alarm and fault management on the system's control panel, thereby optimising control and lowering overall costs.

## Protecting High Spaces

In large spaces such as lobbies, atria, high-rack warehouses, distribution centres, industrial production areas, airports and hangars – ceiling heights in excess of 12 meters can make the use of conventional detectors totally ineffective. Stratification – the term used when smoke sits in a layer well below the ceiling – occurs when smoke does not have sufficient thermal buoyancy to reach the ceiling where detectors would ordinarily be situated.

Beam detectors are sometimes used in this kind of scenario in place of ceiling-mounted detectors, but they are inherently low in sensitivity and also prone to false alarms caused by building movement, airborne activity and high-level operation of equipment such as cranes or forklifts interrupting the beams. Maintenance of ceiling-mounted detectors at these kinds of heights is also fraught with difficulties.

Maintenance is, of course, vital for any detection system to carry on operating in optimum condition. In the case of conventional point detectors, the high number of devices covering any area or the accessibility of their positioning can create all kinds of practical difficulties. In some instances such as public buildings, areas or even the whole buildings often need to be closed for maintenance to be undertaken safely. The positioning of the detection chambers of aspirating systems being

away from the protected area, means that access is often much easier. This is particularly true of high ceilings, but under floor voids, escalators and other inaccessible areas can also benefit from the easier maintenance of aspirating systems.

## Dependable yet Unobtrusive

There are those places too where an aesthetically appealing fire protection solution is desired or where high detection sensitivity is needed for the protection of cultural assets. In historical buildings, museums, galleries, theatres, cinemas, artefact collections and archive rooms, the items and assets housed there are often irreplaceable.

Sometimes, in historically important buildings with ornate interiors such as cathedrals and palaces or places of aesthetically sensitive architecture, the systems put in place must also respect the historic significance and visual and aesthetic appeal of the settings, which are often complex and unique. In prisons and correction centres, systems need to be as unobtrusive as possible or concealed for a much different reason. In these cases the less visible the systems are the better, in order to avoid the wanton vandalism of detectors, which is often a recurring problem in penal institutions.

By using capillary tubes to carry the air to be sampled to the system's pipe work, aspirating detection systems can be barely visible to even the most enquiring eyes. The capillary tubes can be flush terminated or easily hidden within features such as light fittings on the ceiling because the sampling tubes are so small.

## The Benefits of Aspirating Detection in Short

Aspirating smoke detection originally developed for use in the IT industry to provide the earliest possible and most reliable detection in highly ventilated environments, has since been implemented with great success in a diverse range of applications – from heritage buildings and retail complexes to flour mills and metro stations. Its ability to detect combustion in its very earliest stages means that it can be used with efficient and timely extinguishing systems to prevent fires rather than simply detect them. Its high detection reliability and its immunity to deceptive phenomena make it the ideal choice in many difficult and challenging environments. The practicalities it brings for maintenance and unobtrusive detection makes it the preferred option to standard point detection and other systems in so many more.

IFP



**ASD keeps unwanted or 'false' alarms to an absolute minimum**

**James Ivanovski** is Product Manager at Siemens Building Technologies Division

For further information, go to [www.siemens.com/buildingtechnologies](http://www.siemens.com/buildingtechnologies)

The Siemens logo is displayed in a white rectangular box in the top left corner of the advertisement. The background of the entire advertisement is a photograph of a grand, ornate interior space, likely a historical building or museum, featuring a high ceiling with intricate plasterwork, several large, multi-tiered chandeliers, and dark wood paneling on the walls and floor. A large, ornate, cylindrical object, possibly a safe or a decorative structure, is visible in the center of the room.

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Aspirating smoke detection (ASD) continuously draws air samples from the areas requiring protection and evaluates these for the presence of smoke. The new aspirating smoke detectors from Siemens offer highest reliability and immunity to deceptive phenomena, thereby preventing downtimes and costs caused by false alarms.

The aspirating smoke detectors are particularly suitable for application areas where environmentally challenging conditions prevail, where an aesthetically appealing solution is desired or where high detection sensitivity is needed. Furthermore, the detectors can be directly integrated into a fire detection system from Siemens.

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**Julian Bailey**

Hochiki Europe

# Light Refreshment

The growing sophistication of emergency lighting systems means that as well as being a vital part of a building's life safety infrastructure they can also save money and reduce CO<sub>2</sub> emissions thanks to the advantages intelligent LED-based solutions with advanced battery technology have over traditional systems.

**A**nyone who has had the misfortune of being in an unfamiliar building when a fire alarm is activated or a main lighting failure has occurred will understand the true value of an emergency lighting system. Although we often take these familiar green and white signs for granted, emergency lighting's role, as part of an overall life safety system, should never be underestimated. Recent years have witnessed significant advancements in the technology deployed in these systems, with the result that they now offer a level of intelligence that combines energy efficiency with reliability and ease-of-use.

### Bad Behaviour

The way in which we use energy is constantly in the spotlight and if further proof was required of the need for all of us to address our behaviour it came in a 2013 report by the Intergovernmental Panel on Climate Change (IPCC). It stated that scientists are 95 percent certain that we are the

'dominant cause' of global warming since the 1950s.

This might not come as much of a surprise. However, through greater awareness of the effects of CO<sub>2</sub>, combined with the financial implications of rising utility bills, organisations are more willing and able than ever to use energy wisely. Growing legislation and regulation means that businesses all over the world are implementing energy reduction measures. The focus is often on adopting renewable energy technologies such as solar photovoltaics (PV), wind turbines and ground and air source heat pumps as ways to generate power, while others are using building management systems (BMS) to gain a holistic view of their energy use and identify ways to lower their consumption.

However, the pressure is on to do even more, which is why building owners and managers are having to drill down and look at individual elements of their building services infrastructures to see whether there any additional savings can be made.

## EMERGENCY LIGHTING & SIGNAGE



### Light Years Ahead

Modern emergency lighting systems offer the possibility for significant energy and cost savings. This is due to two key factors – the use of light emitting diode (LED) based lighting and advanced battery technology.

Traditional emergency lighting systems utilise crude nickel cadmium, nickel metal hydride or lead acid batteries. They drive the centrally operated system by continually charging, discharging a little and then recharging – a process that uses unnecessary amounts of energy and quickly decreases the lifecycle of the battery. It means that battery life is limited to between one and four years, dependent upon the application.

State-of-the-art intelligent technology, however, utilises only the amount of power needed to fully charge the emergency lighting batteries, and then shuts the battery down until an emergency situation occurs. This avoids degradation, prolongs life and reduces energy consumption. Some systems are also available with luminaires that are equipped with integral batteries allowing continued operation for at least three hours, even in cases where the control panel or power cables are damaged. Maintained luminaires can be powered directly from the line so as not to affect any battery capacity therefore leaving the batteries in an “always ready” state.

So what sort of energy savings can be made as a result? It is estimated that intelligent battery systems use between five and ten percent energy of that a traditional battery system would use. Consider larger installations of up to 5,000 luminaires – which are not uncommon in hospitals, for example – and the savings soon become apparent.

### Bright Spark

It is estimated that lighting accounts for more than 19 percent of the world's total electricity consumption. According to Green LED Solutions, if only half of worldwide lighting was converted to LED by 2025, power use would be cut by 120GW, saving £66 billion a year and reducing CO<sub>2</sub> emissions from power plants by 350Mt over the same period.

LED lighting has seen rapid adoption and the global market was worth \$25.4 billion in 2013, according to a Digitimes Research Special Report.

LED technology is both cost effective and environmentally friendly, making it a greener alternative to other systems that are currently available and allowing operating costs to be kept to a minimum without compromising efficiency.

LED technology is now being used in emergency lighting systems and these new luminaires offer some impressive savings. For instance, they consume less than 0.5W, while a similar 8W fluorescent light exit luminaire will use approximately 12W. These systems also come with additional energy saving features, including signage that is connected via low voltage 40V cabling, which is powered and configured on the same loop via a single panel, giving high levels of control via an automatic system.

### Testing Times

All emergency lighting systems must be tested on a monthly basis in compliance with BS EN 50172. The test itself usually involves flicking a manual switch, which interrupts the power supply to the luminaire, so that it illuminates. A full record sheet needs to be maintained for each emergency luminaire and entered into a logbook, which must be available for inspection by the authorities at any time. Failure to provide full test records can result in legal action and closure of the building, and if the emergency lighting is defective, the insurance policy for the building may be invalid.

On the surface this all seems reasonable and fulfils the requirements of the Standard, however, the testing process itself is flawed and does not necessarily result in a safe and fully functional system. All it does is check that the system works for a few seconds when the manual switch is operated – what happens if the system fails five minutes after the test? It will not be retested for another month, so could leave a building's occupants vulnerable in the meantime.

Also, it does not test just for how long the luminaires will stay on and whether the battery has enough power to maintain operation for the period specified in the relevant standards. The time required to evacuate the premises depends on its size and complexity. The duration itself is dependent not only on evacuation time but also on whether the premises are evacuated immediately the power and normal lighting fails and/or are reoccupied immediately the supply is restored.

BS EN 50172 states the minimum duration of an emergency lighting system as one hour. However, a minimum duration of three hours should be used for emergency lighting if the premises are not evacuated immediately, as in the case of sleeping accommodation, for example, or if the premises will be reoccupied immediately the supply is restored without waiting for the batteries to be recharged. It should also be noted that to comply with the National Fire Protection Association (NFPA) 101 Life Safety Code, emergency lights are required to stay lit for 90 minutes.

Modern emergency lighting control panels continuously monitor and test functionality in real time. They can also be pre-programmed to carry out specific monthly, six monthly and annual tests and it is also possible to set operational parameters up to alert when batteries are at 85 percent capacity, providing a high level of reassurance that the system will work correctly under all circumstances.

### Right Place, Right Time

Evacuation is usually hindered by a lack of detailed knowledge of the internal connectivity of the building space, along with confusing and poorly thought out instructions. Studies have also shown that in these situations occupants usually make use of familiar routes – typically using the exit through which they entered the building. Even more worryingly, research from the University of Greenwich, as part of its study called Human Behaviour in Fire Network (HUBFIN), found that only 38 percent of people see passive signage in an emergency. This is a frightening statistic and only serves to highlight the importance of siting an emergency lighting system in a way that will guide people to a safe location in the event of a mains lighting failure.

BS EN 50172 offers guidance on the positioning of luminaires, provides a minimum standard that should be applied and gives guidance on specific hazards and points of emphasis that have to be accounted for. Points of emphasis are mandatory locations where lighting must highlight specific hazards, safety equipment and signs. These include areas near stairs, near changes of level, at each change of direction, near firefighting equipment and manual call points, outside and near to each final exit, first aid points, at exit doors, and near safety signs.

Signs are either internally or externally illuminated and the maximum viewing distances for internally illuminated signs is 200 times the panel height, and 100 times the panel height for externally illuminated signs. Luminaires must offer 1Lux of output in escape routes and 0.5Lux in open areas. Emergency lighting should also be positioned in such a way to ensure that people are free from disability glare, which can prevent obstructions or signs from being properly seen.

It is worth remembering that Industry Committee for Emergency Lighting (ICEL) approved products are independently tested and meet the current product and application standards. Therefore, selecting products with ICEL approval will provide reassurance of compliance.

### Look to the Future

The problems with passive signage are clear from the University of Greenwich's HUBFIN research, which is why the integration of fire detection and emergency lighting systems is the next step in adding intelligence and greater effectiveness to a life safety infrastructure.

A traditional emergency lighting system does not allow signs to be 'shut off', which can allow people to unwittingly travel into the path of danger. In places such as hospitals and care homes, where people often have restricted mobility, time is of the essence and must not be wasted by having to decipher the most appropriate escape route.

By integrating a fire detection system with emergency lighting, and by identifying where a fire is taking place, the correct route can be configured and communicated. For example, by responding to information sent from the fire detectors it is possible to put a red 'X' on specific emergency luminaires, which signals to people not to exit via that particular route. This can also be synchronised with the existing PA/VA system, adding another level of safety.

Not only does integration make good sense

### Facts of the Matter

- Lighting consumes 19 percent of all electricity in the world.
- The first LED device was crafted in 1907 by Captain H J Round, a British radio technology pioneer and a personal assistant to Guglielmo Marconi.
- Nick Holonyak Jr is considered 'the father of the modern LED'. In 1962, while working at General Electric, he developed the first practically functional visible spectrum LED device for commercial use.
- In 2009, a typical 13W LED lamp emitted 450-650 lumens, which is equivalent to a standard 40W incandescent bulb. LEDs have become more efficient, so that now a 6W LED can easily achieve the same results.
- LEDs produce a long service life of between 50,000 hours and 100,000 hours. This compares with 2,000-5,000 hours for a halogen bulb and 8,000 hours to 15,000 hours for a compact fluorescent lamp (CFL).
- Unlike CFLs LEDs do not contain mercury and can be more safely disposed of.
- LEDs emit no ultraviolet radiation (UV) or infrared (IR), which makes them perfect to illuminate costly objects such as photographs, collections, paintings etc.
- LEDs produce more light than heat, which makes them the safest form of lighting and reduces the risk of fires.

from a safety point of view, it has a number of cost saving and environmental benefits. It is estimated that it could reduce the entire system's wiring content by 75 percent, as there would be only one loop with both functions.

### Feature Packed

A correctly specified, installed and maintained emergency lighting system is crucial in order to give occupants a way of evacuating a building safely in the event of a mains lighting failure, or if required, a fire. The regulations, standards and guidance on this subject are comprehensive and the advanced LED lighting and battery technology that is now available combines reliability, functionality and usability with another way to save energy.

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**Julian Bailey** is Regional Sales Manager at Hochiki Europe

For further information, go to [www.hochikieurope.com](http://www.hochikieurope.com)



# Oxygen Reduction

*Oxygen reduction fire prevention installation, Sydney Adventist Hospital, Australia*



**Martin McGettrick**

ARA Group

Oxygen-reduction fire prevention is a revolution in fire safety, and the world's latest technological innovation in fire prevention. It has the unique ability to create an environment of breathable, controlled oxygen-reduced air that prevents fire ignition. Oxygen-reduction systems prevent fire proactively instead of suppressing a fire after it has started and damage and business interruption has occurred.

Oxygen-reduction fire prevention uses a technology that produces oxygen-reduced (hypoxic) air by partly filtering out oxygen from ambient atmospheric air. Normal atmosphere contains 21 percent oxygen. The hypoxic air injected into a protected space is 15 percent oxygen and 84 percent nitrogen (1 percent is made up of argon, carbon dioxide and other gases). A fire cannot start in this environment. Common flammable solid materials and liquids cannot be ignited with an oxygen level below 16 percent.

### **Safe for People and Safe for the Environment**

Oxygen-reduction fire prevention uses ambient air to produce breathable air for fire prevention. It is safe for people and safe for the environment – no chemicals or gases are involved. The oxygen-reduction fire prevention agent is simply oxygen-reduced (hypoxic) air.

Hypoxic environments created for the purpose of fire prevention are precisely controlled and monitored reduced-oxygen environments. They should not be confused with other environments where hypoxic conditions can occur in an uncontrolled, unwanted or unexpected way. Oxygen-reduction fire prevention systems are clean-air systems. There has been extensive medical research in the UK, Europe and Australia to support the safety of working in a hypoxic environment of oxygen at 16 percent and below.

At sea level, 15 percent oxygen content is equivalent, in terms of human physiology, to normal atmospheric air at an elevation of around

2,700 metres above sea level or being on a commercial flight. Millions of people around the world live at altitudes equivalent to exposure at or below 15 percent oxygen concentration at sea level. Hypoxic air environments are currently used for physical training and rehabilitation of athletes, as well as in medical research.

### **What are the Suitable Environments?**

Oxygen-reduction fire prevention is best suited to any situation that requires the highest levels of fire prevention, and where uninterrupted operation is essential including high-value technical installations such as data centres, server rooms, and electrical switch rooms.

Hypoxic air has no detrimental effect on equipment. The oxygen-reduced environment slows oxidation and is perfect for preservation of irreplaceable items such as archived documents, museum exhibits, artworks and rare artefacts.

Typically, applications include: data centres; server rooms; electrical switch rooms; power correction rooms; control rooms in power plants; telecommunication rooms; laboratories; libraries; museums; archive rooms; warehouses; hazardous materials storage; food storage areas; deep freeze environments; and cold storage rooms.

### **How does the System Control Oxygen Monitoring?**

The system is designed to enable the oxygen concentration levels to be monitored on a continual basis by a minimum of two independent oxygen sensors, in different locations, in each protected

# Fire Prevention

space. The monitoring units are typically placed at eye level, at an appropriate distance from the door of the room. This is to provide for monitoring of oxygen conditions and alert if doors are wedged open or not closed properly, while minimising the amount of false, high oxygen alarms. The oxygen sensors transmit to monitoring and control points (for example, the fire alarm panel and the building management system), as required.

Performance indicators show, as a minimum, for each protected space:

- Oxygen concentration level as indicated by every oxygen sensor.
- High and low oxygen alarm conditions.
- An output indicating the operation of any other system alarms.

## Health & Safety

The design aim of any oxygen-reduction fire prevention system is to create and maintain an atmosphere in an enclosure that is capable of preventing ignition of combustibles found within the protected area while simultaneously remaining safe for the occupants.

A risk assessment, in accordance with AS/NZS ISO 31000-2009, *Risk management – Principles and guidelines*, should be carried out prior to any installation of an oxygen-reduction fire prevention system to ensure safety of both people within the protected area and those outside the protected area that may be exposed to output air from the oxygen-reduction fire prevention system.

Such an assessment shall detail:

- 1 The safeguards employed for people having access to the protected space and oxygen-reduction fire prevention system equipment.
- 2 Limitations to the number of people allowed in the protected enclosure and the level and duration of physical activity permitted to be undertaken.

## Installation

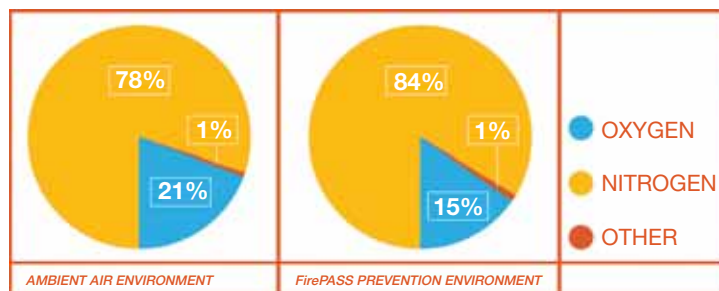
Oxygen-reduction fire prevention systems come readily mounted and tested. Once on site, the system is connected to the room sensors and to the power supply. The system is then connected to the rooms via the installed tubing. The by-product oxygen-enriched air is vented outside.

Oxygen-reduction fire prevention systems have a smaller footprint compared with conventional gaseous suppression systems and do not require rigid piping within the protected spaces. The only requirement is simple; minimal pressure piping to each protected area and to the ambient air, along with wiring of the oxygen monitoring units in the protected areas.

It is recommended that protected areas be equipped with highly sensitive smoke detectors such as very early smoke detection apparatus (VESDA) or equivalent. This is to ensure that any

smouldering combustion from cable faults, for example, is reported in its incipient stages.

A comfortable, breathable atmosphere is created inside the protected space by the ongoing ventilation with fresh, hypoxic air. The highly reliable hypoxic air generators require very little maintenance – a maintenance cycle of six months is typical. Regular monthly inspections are recommended to ensure a fire preventative atmosphere is maintained.



*Ambient air environment compared to oxygen-reduced environment*

### Oslo Museum of Cultural History, University of Oslo, Norway

The Museum of Cultural History is one of Norway's largest cultural history museums. It holds the country's largest prehistoric and medieval archaeological collections, including the Viking ships at Bygdøy, Norway. The museum also has a comprehensive ethnographic (study of people and their cultures) collection that includes objects from every continent, as well as Norway's largest collection of historical coins. An oxygen-reduction fire prevention system is protecting six areas of approximately, 14,000 cubic metres.

### Ministry of Defence Pension Fund, Muscat, Oman

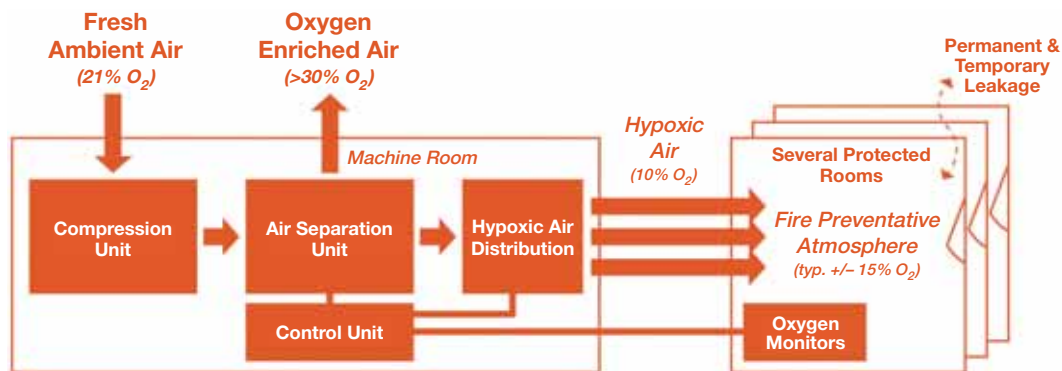
Muscat is the capital of Oman. The city lies on the Arabian Sea, along the Gulf of Oman. It is one of the Middle East's oldest cities. An oxygen-reduction fire prevention system is protecting nine areas in the Muscat Data Centre.

### Sydney Adventist Hospital, Sydney, Australia

Sydney Adventist Hospital (SAH) is NSW's largest single campus private hospital, a multi-award winning facility offering access to world-class doctors, nurses and other health professionals. With approximately 2,300 staff, 500 volunteers and 750 accredited medical practitioners, SAH offers comprehensive surgical, medical, and emergency services to more than 53,000 inpatients and 180,000 outpatients each year.

An oxygen-reduction fire prevention system is protecting several rooms at the SAH, including the power factor correction room and the hospital's main switch room that feeds the operating theatres; a volume of approximately 500 cubic metres.

## System Configuration



Oxygen-reduction fire prevention systems can be implemented as an alternative, but also as a complementary or supplementary option that enhances the conventional fire-safety means without interfering with their performance.

### Sealing the Rooms

It is essential the protected area is well sealed in order to minimise the permanent leakage of air in and out of the room. The key factor relating to running costs (energy consumption and maintenance) of an oxygen-reduction fire prevention installation is the leakage. This is the sum of permanent leakage of the protected area and the temporary leakage created by door openings. Investing in improving the sealing of the protected areas will have a direct impact on running costs, as they are directly proportional to the leakage rate achieved. Typically, the payback for such improvements is less than one year. All spaces in the protected area must have split-type air cooling or closed, dedicated air recirculation systems.

To evaluate the current leakage of the area to be protected, it is recommended to perform an integrity fan test (accurately predicts the room's pressurisation and identifies any leaks in the room), prior to any works being commenced.

### Venting/Cooling

The area where the compressors and filtration units are housed is required to be well-vented in order to allow a permanent supply of fresh, ambient air to the compressors. Alternatively, the room can be cooled with chillers; this will also require a supply of fresh air. There is a requirement for a small drain in the machine room for the wastewater of the condensate cleaner.

### Maintenance

The oxygen-reduction fire prevention generators are highly reliable passive units that can operate for decades with proper maintenance. This normally includes, as a minimum, changing the filters after every 3,000 operating hours or at latest after 12 months. This cycle applies if the supplied fresh air is compliant with the required quality. If the air quality is lower (in the event of dust, humidity, temperature etc.) the cycle of filter changes needs to be reduced. The compressors require regular maintenance with a cycle of 2,000 running hours.

### Inspections

#### • Acceptance test

The operator/operating company must subject the oxygen-reduction fire prevention system to an acceptance test by a qualified person after

installation or after any significant modification to the system. This test must take place prior to commissioning.

#### • Regular Inspections

The operators /operating companies must have the proper function of the oxygen-reduction fire prevention systems tested by a qualified person at least once per year. Special operational circumstances may make it necessary to carry out more frequent inspections.

#### • Record of Inspections

The results of the inspections must be recorded in an inspection report. The records of the acceptance tests must be kept throughout the operating time of the oxygen-reduction fire prevention system. The records of the regular inspections must be kept for at least four years. These may be stored on computer data carriers. The documents must be presented to the competent supervisory authorities upon request.

### Limitations on Installation

Oxygen-reduction fire prevention systems should not be installed for use in areas where:

- Sufficient infiltration control cannot be achieved.
- An alternative source of oxygen is present.
- Oxidizing agents exist that have the potential to reduce oxygen concentration by chemical reaction (for example, chlorine).
- Substances or processes exist that evolve gases capable of modifying the atmosphere such that the oxygen concentration is reduced (for example, toxic displacement).

### Benefits of Oxygen-Reduction Fire Prevention

- Certainty of avoiding the outbreak and spread of fire.
- Continuous fire prevention without any interruption; no refilling or replacement required.
- Straightforward installation process compared with a sprinkler system or a traditional fire suppression system.
- Very small footprint and little building space required.
- Environmentally friendly – no chemicals used.
- Simple to install and maintain.
- Easily installed into existing premises as well as newly built spaces.
- Retaining access to protected areas at any time.
- Scalable to fit any sized area, large or small.
- Slows oxidation and reduces deterioration of materials, equipment, documents and artefacts.

Oxygen-reduction fire prevention systems provide unmatched fire safety and achieve the ultimate goal in fire protection – fire prevention.





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# Advances in Detec Protects Lives & A



**Tim Checketts**

System Sensor Europe

In any automatic fire detection system, the detectors are the front line in the fight against fire. Detectors and call points initiate the alarm signals that activate the control panel. The panel initiates the alarm and shuts down building services that could cause the fire to spread and alerts the emergency services. Detection technology has advanced significantly in recent years, providing greater levels of protection and false alarm immunity than ever before and widening the choice of solutions for building owners and occupiers. This article outlines the key considerations when specifying different fire detection solutions.

**T**he requirements demanded of any fire detection system are inherently simple. It should:

- Respond to a fire as quickly as possible to give the building occupants the greatest time to evacuate the building in an orderly manner.
- Not generate false alarms that will disrupt the everyday business carried on in the protected premises.

Modern electronics hardware and software technology has revolutionised the capabilities of the detectors themselves, the communication protocols between the detectors and the way in which the control panel reacts to the signals it receives from the detectors. Arguably, the intelligence now embedded in the detectors and the advances in detection chamber design have been the primary driver that has brought fire detection systems to their current level of sophistication and performance.

For example, today's detectors feature adjustable sensitivity levels, automatic dust compensation, multiple pre-alarm and alarm thresholds, fault monitoring and loop isolation; all features controlled by embedded software in the device. Working in conjunction with the control panel, an automatic fire

detection system is extremely versatile, configurable and controllable, capable of being configured for changing occupancy patterns, risk profile changes and environmental variables.

### Which Detector Technology to Specify?

Detectors can be segmented into two main types: aspiration systems and point detectors. Given that the key criteria for any fire detection system is to provide cover throughout as much of the building as possible, the choice between aspiration and point detection is a critical one. It is often a finally balanced decision between the two types when planning a new installation. The environments for which both are suitable have become more closely aligned following recent advances in aspiration technology. Other key criteria include the required speed of response, the impact that a fire would have on the equipment and premises and the occupancy patterns of the protected building.

### Aspiration Systems

In an aspiration detector, networks of sampling pipes are connected to very sensitive optical detectors. Aspiration systems include sophisticated filtering that removes dust particles but allows the



# tor Technology ssets

products of combustion through to the detection chamber, preventing false alarms without degrading the system's ability to give very early warning of fire. The characteristics of a modern aspiration system make it suitable for protecting a surprisingly wide range of different facilities.

## Standards

Aspiration systems were originally separate from the building's main fire detection, installed to protect specific parts of the facility where enterprise-critical equipment such as the IT facility was housed. Latterly, aspiration systems are protecting a much wider range of locations, a fact recognised in the recent publication of EN54-20.

EN54-20 is a mandated standard under the Construction Products Directive (CPD), which introduces a new classification system for aspiration systems, defining Class A, B and C sensitivities.

### Class A: Very High Sensitivity for Enterprise Critical Facilities

Across all businesses, fire not only has direct impact but also causes significant reputation damage. Twenty-five percent of data centres do not reopen following a major disaster; seventy percent of small firms that experience a major data loss go out of business within a year, and fifty percent of businesses report that IT downtime damages their reputation.

The newest aspiration technologies are capable of delivering ultra-high sensitivity along with false alarm immunity – essential for providing the earliest warning and service continuity in data centres and computer rooms, the heart of almost every modern business.

### Class B Enhanced Sensitivity for Restricted Access Area

In facilities such as power plants, physical access is restricted because of the potential danger to life. Conversely, in clean rooms and laboratories, the disruption caused to the installed equipment and processes by people entering is not acceptable. As only the sampling pipes intrude into the protected space, routine maintenance is performed outside the area which means costs are reduced as there is no requirement to shut down the facility. Aspiration also extends protection to areas such as lift shafts and under-floor or ceiling ducts where access for point detector installation and maintenance is physically difficult or impossible. Lifts for example do not need to be deactivated for smoke detector testing when using aspiration and no specialist resource is required in order to minimise building disruption and cost.

### Class B for Large Spaces such as Warehouses/Stadia

Aspiration detection is an effective option for protecting high racking warehouses. The 10.5-metre



maximum installation height for point detectors may be too low, and beam detectors, which can be installed at heights up to 25 metres, may not have an unobstructed field of view. Large public areas such as stadiums are also affected by changes in airflow and smoke stratification which can cause issues for traditional smoke detection methods. Furthermore, aspiration detection solves the testing and maintenance issues associated with locating smoke detectors installed at high level.

### Class B or Class C, Normal Sensitivity for Challenging Environments with High Levels of Dust & Dirt

The latest aspiration systems use sophisticated filtering techniques to remove particles larger than 20 microns but allow the products of combustion through to the remote detection chamber. This provides a very effective, false alarm free alternative to point detectors in dusty and contaminated applications such as food and drink manufacturing, pharmaceutical facilities, wood processing plants, flour mills and similar industrial facilities. Newer technologies are also impervious to high airflow and temperature extremes that can cause false alarms in point detectors.

### Class C for Historic Buildings & Areas where Aesthetics are Important

The combination of discreet small-bore sampling pipes in the protected area and the remote aspiration detection unit provide an unobtrusive method of protecting heritage properties and high-end architectural buildings where aesthetics are important.

### Integrated Communications

The trend toward ever-greater integration of the disparate systems to be found in a typical modern building has affected the requirements demanded of aspiration detectors, with multiple





communication channels provided in the latest products to be brought to market. Integral IP connectivity enables remote interrogation and monitoring using TCP/IP protocols over LAN or WAN networks. Alerts can be automatically broadcasted to a number of different email addresses. The IP capability runs in parallel with the normal comprehensive communications with the fire control panel, which enables extensive fault monitoring. Modbus protocols can also be embedded, enabling seamless integration with building management systems without any additional hardware or software.

### System Design

EN54-20 states that each ASD manufacturer must supply a specific software design tool that produces EN54-20 compliant designs based on the detector class selected. This software design tool is not to be interchangeable with other manufacturers. System Sensor's FFAST and FFAST LT aspiration systems, for example, have device-specific Pipe IQ and PipeIQ LT design packages. The software generates the pipe design and layout, the BOM and exports the reports showing conformance to EN54-20. In addition to the design element, the software also includes a test and monitoring module for ongoing supervision once the system is installed. This system also features Acclimate mode, which, configured through PipeIQ, further reduces the device's susceptibility to nuisance alarms, providing maximum protection from a device located in changing environments. During the first 24 hours of operation, the device monitors its environment. After the initial 24-hour period, the device adjusts the alarm point based on the particulate levels over a rolling one-hour period, adjusting the alarm level based on the stability of the environment being monitored.

### Point Detectors

The major advantage of point detectors in an intelligent fire system is that the source of the fire is identifiable to the exact location of a single detector.

In the past, point detectors were either thermal or smoke detectors. Thermal detectors responded either at a fixed temperature or to a temperature change; smoke detectors detected the presence of particles of combustion in the air. A point smoke detector offers the best combination of speed of response with immunity to false alarms for the majority of commercial applications.

The very first smoke detector, developed in 1941, was the ionisation smoke detector, which was the foundation of today's multi-billion pound global fire detection industry. Ionisation technology is particularly effective in detecting the small

particles of combustion produced by fast flaming fires, but it is less responsive to the larger particles produced by smouldering ones. In many countries, ionisation detectors are no longer approved, and the regulations surrounding the transportation and disposal of low-level radioactive materials have become more stringent and consequently more expensive. With increasing emphasis on environmental considerations, the use of products incorporating radioactive sources in commercial fire systems is now discouraged. The most widely used technology is now the optical detector, originally developed to improve the speed of response to slow-developing fires.

### Multi-criteria Detectors

The most significant advancement in detector technology has been the development of multi-sensor devices, primarily designed to overcome the relatively poor performance of the optical detector in responding to fast fires with low particulate generation but significant heat rise. The photo-thermal detector was developed to address the inevitable balancing act between increasing the sensitivity of a detector so that it responds more quickly to an incipient fire and the consequent increase in the false alarm rate.

Originally crude units, in which two independent sensors, an optical and a thermal detector were mounted in a single housing, the availability of low cost embedded microprocessors enabling has enabled true composite units to be developed. Signal processing in the detector head itself resulted in the panel being presented with a single composite result from the raw data generated by the two sensors, improving the effectiveness of the device across the fire spectrum.

The multi-sensor detector concept has now been extended with the addition of further sensors, each one optimised to detect a specific product of combustion, typically carbon monoxide, heat and particulate matter. It is well known that every fire has a different profile during its development; the proportions change from one fire type to another, as does the time during which each element is produced, but in every case, to a greater or lesser extent, each of these three elements will be present. In cases where the fire is flaming, it will additionally produce a changing light signature as the result of the flame generation. Several manufacturers have introduced tri-sensor devices, in which the smoke and heat detectors are augmented by the addition of an infrared light sensor. Again, embedded intelligence in the head manages the inputs from the three sensors. Extending this principle even further, the latest multi-sensor detector to be launched is a quad sensor device, which combines optical, thermal, carbon monoxide and infrared detectors into a single device.

### Conclusions

Without doubt, technology advances have been adopted to great effect by fire detector manufacturers that play a vital role in the life safety industry. The leading manufacturers share the common aim of increasing the protection levels and false alarm immunity provided to the users of the buildings they protect. New detection products currently in development will make their contribution as part of ever more efficient automatic detection systems in the future.

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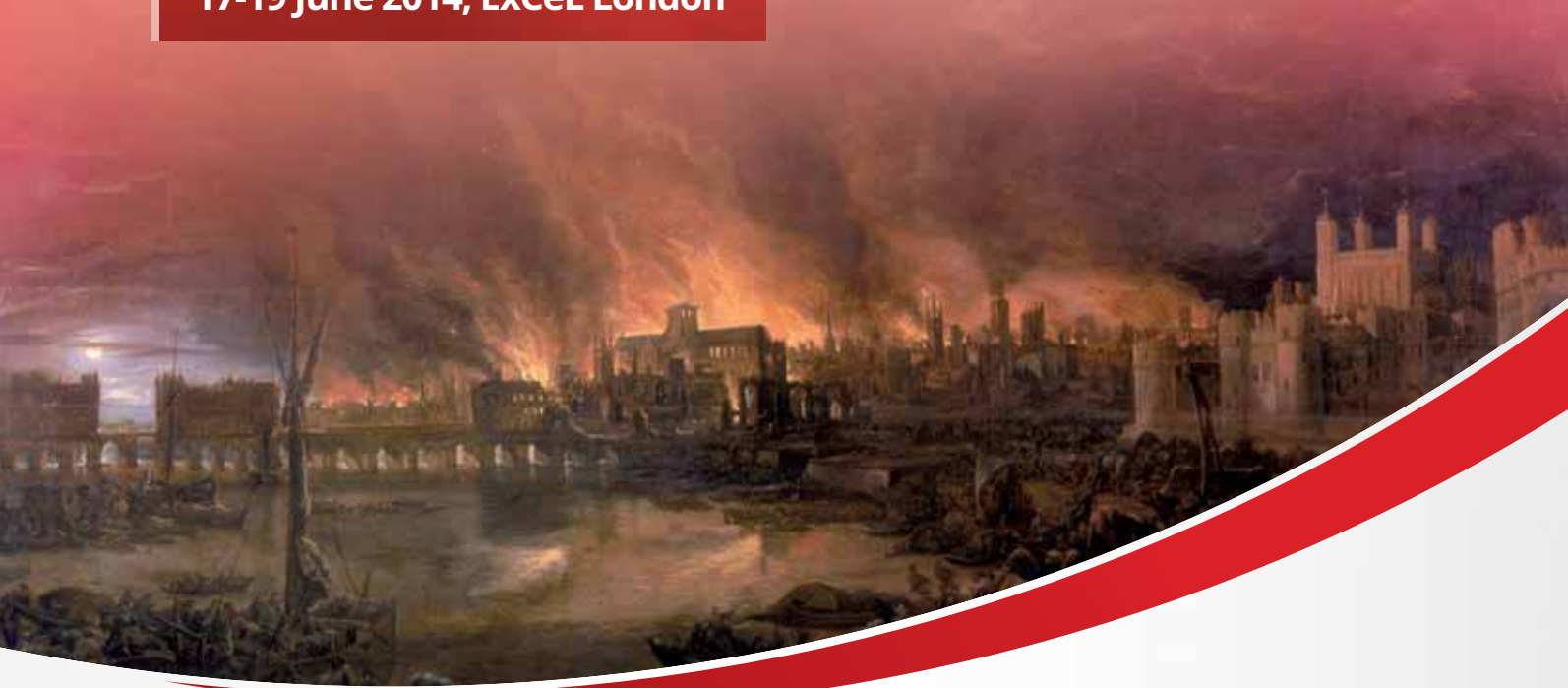
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*Passive fire protection must be considered throughout the life of a project. Pic courtesy of Mmaxer/Shutterstock.com*



**Niall Rowan**

Association for  
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What needs to be considered in the construction process to ensure adequate passive fire protection in buildings?

**P**assive fire protection; it is really not that exciting a term and I am sometimes envious of our colleagues in the active area, as the word 'active' makes 'active fire protection' somehow sound much more dynamic and exciting. And yet, passive fire protection is critically important in providing fire safety in buildings.

What needs to be considered in the construction process to ensure adequate passive fire protection in buildings? One message that needs to be stressed is that passive fire protection is not something that can be 'bolted-on' at the end or half way through a project; it needs to be considered from when the development is still in concept form right through all the stages until maintenance of the completed building.

## **What is Passive Fire Protection?**

Passive fire protection makes buildings safe when fire occurs; by ensuring the building does not collapse and by subdividing it to prevent the spread of smoke and fire. Passive fire protection comprises those elements, for example fire doors, walls, protection to the structural frame and protection to services passing through walls/floors, which are specifically engineered to fulfil this function. In some cases, this may be in addition to their normal function in a building.

It is vital that all passive fire protection measures are correctly designed, specified and installed if

the building is to behave as expected should fire break out. By their nature they are 'passive' until there is a fire and only then will their fire performance in-situ be demonstrated. The occupants of a building will attend to their daily business; visitors will shop, be entertained, or enjoy recreation without any knowledge of the passive fire protection measures that will protect them in fire. So it is essential that these measures will work if an emergency occurs.

## **What Defines the Passive Fire Protection that is used in a Building?**

Building Regulations usually deal with life safety standards for the design and construction of domestic, commercial, residential and industrial buildings. The provisions are often expanded in Statutory Guidance Documents (for example, Approved Document B in England and Wales) which give detailed guidance on how to meet the Building Regulations. Depending on local or national regulations, alternative ways to satisfy Building Regulations can use less prescriptive methods, including the engineered approaches embodied in, for example, ISO/TR 13387-1, BS 9999 and DD 7974, which are increasingly used as designers seek more freedom to innovate in building design.

Building Regulations will also usually only consider life safety. Other issues such as; protecting



# adle to Grave

the building fabric/contents, business interruption, heritage, functionality and environmental protection may also be applicable. These also need to be considered in the fire strategy at the design stage and therefore impact on the need for increased passive fire protection or other measures.

## How are Passive Fire Protection Products Evaluated?

The performance of passive fire protection products is 'proven' by their undergoing fire tests in specialist independent laboratories. The scope of the performance may be further enhanced by assessments (engineering judgements) undertaken by the fire laboratories or fire consultants.

However, the best guarantee of the quality of passive fire protection products is by third-party product certification, which links the tested/assessed product to the actual factory production and ensures traceability from raw material to finished product. It is strongly recommended that wherever possible, passive fire protection products should be supported by third-party certification and that clients/developers, main contractors and specifiers should always require third-party certification.

While legislation does not generally cover installation of passive fire protection products, installers have an obligation to install products correctly so that they will work as intended in the building. The best way of guaranteeing this is to use a third-party certificated installer whose skills, training and competence will have been validated by a third-party organisation backed up by random inspection of completed works. The Association for Specialist Fire Protection always recommends the use of third-party certificated installers and this is a mandatory requirement for any contractor member of the association.

## Procurement Strategy

The procurement strategy for the building may be designer-led, which sees the client/developer appoint an architect in the early stages of the project to seek planning consent for the building and produce designs and specifications according to the regulations and the client needs.

Alternatively, the project may involve Management Contracting. This differs from the traditional designer-led process, in that the management contractor/construction manager, who takes responsibility for delivering the construction of the project, is brought into the process at a much earlier stage, as are other key specialists. This type of procurement is most commonly used for complex or fast track projects where risks tend to be high.

Increasingly, the option of design and build is the preferred approach. Under this option a client will offer the basic concept, or a brief, to construction companies that will undertake to deliver the completed building largely to performance-based



*Fire-engineered solutions may rely on less passive fire protection, so third-party certificated products and contractors are recommended*

requirements. This system requires the contractor responsible for designing all aspects of the project to meet the performance needs of the client within the agreed budget. It can also give rise to some of the worst examples of installation of different types of passive fire protection because the installations are not designed appropriately in advance and the fire stopping contractor is often required to design something 'on the hoof'. Budget and time constraints often mean that the resulting installation is not covered by appropriate fire test evidence and may not work satisfactorily.

## Client/Developer

The ultimate responsibility for fire safety of the building as-constructed rests with the client and/or developer and consequently it is essential that the basic fire strategy for any project should be agreed as early as possible in the design process so that the activities of all sectors involved in the process may be co-ordinated. Any safety objectives that go beyond life safety must be agreed at an early stage. 'Best practice' in passive fire protection will be achieved by setting out the requirements at the start of the project.

## Designers

The building designer has a range of techniques available to protect occupants against fire and smoke. These include:

- Passive fire protection measures to physically limit the spread and effects of the fire, protect escape routes against heat and smoke and stop the building collapsing.
- Detection and alarm systems, to quickly alert occupants and ensure a rapid response.
- Smoke control systems to limit the spread of smoke, or contain it so that it does not hinder escape.
- Suppression systems, such as sprinklers or water mist, to either put the fire out or limit its growth.
- Use of passive and active fire protection measures to 'protect in place', for example, where occupants are immobile or by the use of refuges.

*The correct installation of high quality passive fire protection products is essential to achieving fire safety. Pic courtesy of ASFP member Nullifire*



- Facilities designed into the building to assist the fire service in its efforts to extinguish or control the fire and to rescue trapped occupants.

The design specification will be based on the agreed fire strategy. For the different elements of the building, this specification may show a required performance, or may identify a specific proprietary product. The design needs to specify passive fire protection systems that can actually be constructed properly within the building. It is not sufficient merely to require a fire resisting wall that might contain a mixture of ducts, dampers, cable trays and pipes without some thought as the design of the division, the supports for the services and justifying the fire performance that is required.

Consequently, it is important that the design specification is adhered to during the procurement and construction of the building, despite pressures of time, money and availability. It is strongly recommended that only a limited and controlled number of parties be authorised to change the passive fire protection specification and that any changes be carefully monitored and recorded.

It should be noted that the design considerations outlined above apply just as much to buildings designed using fire engineering techniques as to those designed using conventional code complaint approaches; perhaps even more so, as the engineered solution might rely on less passive fire protection, which is why ensuring it is correctly designed, specified and installed is even more important.

### Constructor

- Main contractors commissioning passive fire protection.

The main contractor is responsible for co-ordinating all the work on the project. In relation to passive fire protection, this includes:

- Selecting specialist subcontractors for passive fire protection installation:

As the objective of passive fire protection material installation is to protect the life of the building occupants, the work should not be allocated to contractors that cannot prove their competency to install such products. Main Contractors should select sub-contractors that carry third-party certification wherever possible.

- Programming activities:

It is crucially important that the installation of passive fire protection, including the correct and timely scheduling of all the sub-contractor work is included as part of the main work programme. This will ensure that the passive fire protection measures are installed in the correct order, preventing unnecessary rework later which, in turn, may lead to an unsatisfactory ad-hoc solution being applied.

### Subcontractors Installing Passive Fire Protection

Specialist sub-contractors will be identified for many sections of the work in a building and passive fire protection should be one of the specialist trades with which separate contracts are placed. By placing this work with specialists, and with careful programming, it is much more likely that the correct materials will be specified and installed, avoiding damage and rework. The Association for Specialist Fire Protection strongly

recommends that all contractors installing passive fire protection hold third-party certification for the products they install.

### Inspection

Inspection of completed works either by the installer, or preferably the main contractor, or best of all a third-party is recommended to ensure adequate installation of passive fire protection. Irrespective of any Building Control inspection, a specific project-based systematic approach involving the actual installer, his/her supervisor, the main contractor and an inspection agency (which may be a third-party certification body) is essential to ensure passive fire protection is installed correctly before other parts of the building are constructed and fit-out takes place. Attempting to inspect and remedy deficient passive fire protection at a late stage is often impossible and/or time consuming, since passive fire protection is often hidden or inaccessible once the building is complete.

### Handover

When the construction programme is completed the main contractor must hand over to the client/occupier the relevant fire safety information, including certificates of conformity from passive fire protection subcontractors. Such information is required to be able to not only operate and maintain the building appropriately, but to be available for any fire risk assessor who is undertaking a fire risk assessment under applicable legislation.

Information on installed passive fire protection will also need to be included in the building's fire safety manual, which should be compiled by the designer for the occupier.

### Maintenance

Most passive fire protection products are robust in nature and require only limited maintenance during their life, which can often be the life of the building. However, there are some exceptions and some products, for example, fire doors, fire/smoke dampers and some fire resisting ducts that require inspection/maintenance/cleaning on a regular basis. Provision must be made for this in the building's maintenance programme.

Inspection of those parts of passive fire protection that are not in plain view, for example, fire-stopping of services above suspended ceilings, is also vital to ensure that completed passive fire protection has not been breached by follow on trades that have not made-good after their work. It is imperative that any breaches in compartmentation – however caused – are made-good as soon as possible. Care must be taken in selecting an appropriately rated repair solution that is compatible with the original installation.

Facilities managers have a key role to play in the



*Inspection of completed works by the installer, main contractor, or a third-party is recommended*

management of breaches in passive fire protection. They are often empowered to plan and supervise the installation of new services on behalf of building owners and occupiers and yet also to fulfil duties in respect of fire safety compliance. The facilities manager must use care in the planning and control of new works in order to have minimal impact on the passive fire protection measures in the building. By specifying third-party certificated contractors to undertake maintenance work, the facilities manager can be assured that works undertaken will use appropriate materials which will be installed correctly.

### Correct installation

The correct installation of high quality passive fire protection products is essential to achieving fire safety in buildings. Passive fire protection needs to be considered from project inception through to maintenance of the completed building; it should not be added as a 'bolt-on' after or during the project. All the players in the construction process have a role to play to ensure that passive fire protection is designed, commissioned and installed correctly.

The Association for Specialists Fire Protection has just revised its *Guide to Ensuring Best Practice* for passive fire protection in buildings that elaborates on the themes included in this article. The ASFP Guide contains everything you need to know about the installation specification commissioning and purchasing of passive fire protection. It will be launched at the FIREX International exhibition in ExCel, London from the 17th to the 19th June.

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**Niall Rowan** is Technical Officer at the Association for Specialist Fire Protection

For further information, go to [www.asfp.org.uk](http://www.asfp.org.uk)



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**Publishers**  
Mark Seton & David Staddon

**Group Editor**  
Graham Collins

**Editorial Contributors**  
Graham Collins, Ron Coté, Kurt Werner, Riley Archer, Alan Brinson, Steve Martin, Bill McHugh, Niall Rowan, Steve Bond, Richard Hosier, Peter Barker, Scott Starr, Chris Miles, Mark L Robin, Sarah Colwell, Ali Aleali

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# Advanced



**Graham Collins**

Email: [graham.collins@mdmpublishing.com](mailto:graham.collins@mdmpublishing.com)

# Is it all Down to Behaviour?

In the 20-plus years that I have been involved in the fire protection industry I have witnessed the growing sophistication of fire detection, alarm and suppression products and strived to get my head around an endless stream of regulations, codes and standards. Not that I am complaining because, by and large, the motive behind these efforts has been to make the world a safer place to live, work and play. But I am not convinced that these efforts have always been matched by improvements in the public's knowledge and awareness of fire safety or to the way in which it responds to a fire.

In some respects I think the advances made, particularly in detection and alarm technology, may have encouraged a feeling that someone somewhere has "taken care of the problem". This, and the fact that in the majority of – but by no means all – developed countries, deaths and injuries caused by fire have declined may have made the man in the street complacent.

So my question is: are we doing enough to educate people about fire safety? Do employees really know what to do in a fire; how to safely evacuate the building and ensure the safety of visitors unfamiliar with either the building or the evacuation routes? Are fire drills nowadays too frequently a tick-box exercise? I am not suggesting that detection, alarm and suppression technology has gone as far as it can go. Rather I am wondering if the next "leap" in fire safety will have its basis in human behaviour rather than technology and the integration of one with the other.

It is not a statistically valid approach to the question, but when was the last time your building had a full-scale fire drill? And I do not mean a drill announced days in advance when everyone had time to arrange to be absent at an "urgent meeting"! How many times have you been to conferences or seminars when describing the evacuation procedure to delegates somehow got overlooked?

A few years ago I was at the sharp end of what at the time was believed to be a genuine emergency and evacuation from a high-rise office block. Ironically, I had been visiting a fire engineering company's offices on the 15th floor of the building. When the alarm sounded, we conscientiously made our way to the staircase (avoiding the lifts) and started to exit the building. On the way we passed floor after floor where no notice whatsoever of the alarm – not to mention the noise we were making in the stairwells – was being taken by employees, so individuals peeled-off to chivvy them into action.

It transpired to have been a false alarm, but had it been a real fire the casualty list could have been staggering. After speaking with a number of dislodged people in the street it transpired that nobody could recall ever having had a fire drill and the only reference as to what to do in an emergency that many could recall was seeing an escape route diagram somewhere in the building.

We can all relate stories such as this, which sadly just serves to highlight the scale and spread of the problem. So something must be done. Leaving it to regulators, I suggest, does not get the desired result; so it is down to us – all of us. I believe that system manufacturers need to move beyond instruction books on how their systems work and embrace the task of advising customers what to do in the event of a fire. Fire engineers, particularly when devising evacuation strategies, need to similarly go beyond their written specifications. And building occupiers have, once and for all, got to accept that fire safety is their responsibility.

In short, I feel there is a pressing need to stop seeing fire safety as being in two parts: detection, alarm and suppression as one part, and human behaviour as the other. It is one challenge, and the sooner we understand that the safer we will all be.

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**Ron Coté**

NFPA

# Technical Advisory Service

Online submission makes it easier to connect and provide support to the NFPA's international members and enforcing authorities.

**N**FPA's technical questions service – commonly referred to as “advisory services” – provides access to NFPA technical staff for association members and enforcement groups referred to as authorities having jurisdiction (AHJs) from all over the world. Users of the service can ask questions by phone or via online submission about any NFPA code or standard, and NFPA technical staff will answer them. A case can involve multiple questions, as well as the back-and-forth of follow-up correspondence with related questions.

It is encouraging to see the service get this kind of use, but it could be even greater, particularly as we provide more support to our international

101, Life Safety Code will seldom be complete if the occupancy classification is omitted; a question applicable to a health care occupancy might elicit a different response than an identical question applicable to an industrial occupancy.

Plans and figures are not allowed to be submitted with members' inquiries, as questions need to be kept generic to avoid falling into the category of consulting services. Carefully chosen words can substitute for visual elements and still keep the question generic. Where essential information is missing, the email reply from staff may ask for additional detail, lengthening the time it takes to provide a useful answer. All written responses

**The technical questions service is well supported by customer relationship management (CRM) software. Permanent, searchable records are kept of all activity to help ensure that inquiries are directed to the appropriate staff member and do not go unanswered.**

audiences. Last year alone, NFPA's technical staff responded to 11,254 cases through the service. Our records indicate that 14 percent of those inquiries came from members outside the United States. As NFPA codes and standards gain formal use and, in some cases, adoption in different countries this service will continue to grow as a valuable tool for our members.

Members and AHJs who do not know about the service, or may be unclear about the method and guidelines for submitting questions, could be missing out on an important tool to help them do their jobs better. NFPA makes it clear that this is not a consultation service, but rather an effective way of better understanding the intent, scope, and detail of NFPA codes and standards.

Some members prefer to submit written questions rather than rely on a telephone conversation. This is the preferred method of our international members. Each method of interacting with staff has its benefits; however a written inquiry and its answer, can sometimes present less room for misunderstanding and the answer lives on for future reference.

In posting written inquiries, members should include, to the best of their abilities, the information that NFPA technical staff needs to understand the question. For example, an inquiry on NFPA

carry a disclaimer advising that any opinion expressed is the personal opinion of NFPA staff and does not necessarily represent the official position of NFPA or its technical committees. The disclaimer also advises that the response is neither intended, nor should be relied upon, to provide professional consultation or services.

The technical questions service is well supported by customer relationship management (CRM) software. Permanent, searchable records are kept of all activity to help ensure that inquiries are directed to the appropriate staff member and do not go unanswered. The advisory program is labour intensive, and an answer prepared for one member might be useful to others; with that in mind, written questions and answers can be scrubbed of identifiers and used as the bases for handbook commentary and online pages of frequently asked questions.

We would like to encourage our international members to take full advantage of this membership benefit and consider our technical advisory services as they continue to utilise NFPA codes and standards in the design, construction and operation of buildings and facilities in their countries. Please visit the document information page for the code or standard you have questions about and click the “Technical Questions” tab.

**IFP**

**Ron Coté** is NFPA Principal Life Safety Engineer

For further information, go to [www.nfpa.com](http://www.nfpa.com)

# New Touchscreen-Controlled Fire Panel

A single-loop version of C-TEC's ZFP touchscreen-controlled addressable fire alarm panel is now available, featuring the same touchscreen interface, 64-node peer-to-peer network capability and 'DeviceManager' functions as the ZFP's 2-loop to 8-loop panels. This addition to the range can also easily be extended using the ZFP's extensive range of programmable indicator and switch modules, expansion 'A-Bus' PCBs and touchscreen compact controllers.

According to C-TEC, the single-loop ZFP has been specifically designed to meet the demand for a very cost-effective yet powerful addressable solution for small-to-



medium sized applications. However, the panel's flexible modular design and its capacity to be networked to multiple panels means it is also ideal for larger projects such as schools and hospitals.

Now available with a graphical interface solution that allows users to view critical events, process alarms and keep secure system logs on a remote PC, the panel can be configured to suit any application, from small 'one-out, all-out' systems to large multi-loop networked systems.

**For more information, go to [www.c-tec.co.uk](http://www.c-tec.co.uk)**

## New SIL2 Compliant Devices

HOCHIKI EUROPE has announced the introduction of a new fire detection range that is independently evaluated and certified to meet the strict requirements of Safety Integrity Level 2 (SIL2), with respect to the IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems standard.

The new SIL2 range includes smoke sensors, multi-sensors, multi-heat sensors, manual call points, sounders and sounder beacons, and a wide variety of detectors. These devices are expected to be of interest to those responsible for configuring life safety systems in hazardous environments such as the oil, gas, petrochemical, manufacturing, transport and process control industries.

SIL approval is fast becoming a prerequisite in the oil and gas markets all over the world, from Australia to the Middle East, North Africa and offshore in the UK. It is also increasingly stipulated for projects within the rail transport sector.

**For more information, go to [www.hochikieurope.com](http://www.hochikieurope.com)**



## Energy Company Chooses Foam Concentrate

THE SOLBERG COMPANY has been awarded a contract by Statoil as its foam concentrate supplier under a new multi-year Frame Agreement in order to achieve the high environmental stewardship standards of the energy company. In a prior agreement, Statoil selected Solberg as its partner in the Statoil LOOP Portfolio Program to develop environment-friendly 1% high-performance firefighting foam using no fluorinated compounds or other organohalogens.

The result is Solberg's Re-Healing RF1, 1% foam concentrate suitable for use on all Statoil offshore and onshore installations. Re-Healing foam concentrates are an environmentally sustainable fluorosurfactant and fluoropolymer-free firefighting foam used to effectively extinguish Class B hydrocarbon and polar solvent fuels with no environmental concerns for bioaccumulation or toxic breakdown. The concentrate can be used in fresh, sea or brackish water and possess excellent fire extinguishment and burn back resistance due to its flow and rapid sealing characteristics.

The first platform selected for retrofit with R-Healing RF1 concentrate was the Kvitebjørn gas and condensate producing installation in the North Sea in the North East Atlantic. The second platform selected was Njord in the Norwegian Sea. On the new oil platform "Gudrun", re-healing RF1 has been used from day one.

**For more information, go to [www.solbergfoam.com](http://www.solbergfoam.com)**

## Water Mist Conference

The 14th International Water Mist conference and exhibition will be held in Istanbul, Turkey on 22nd and 23rd October 2014 at the Lütfi Kırdar ICEC in the heart of the Turkish capital. Day one of the conference will be dedicated to applications only and will include a panel discussion on water mist technology. Day two will be "science & research" day during which experts from universities and research institutes will present new developments and findings. The highlight will be the presentation on the IWMA research project.

**For more information, go to [www.iwma.net](http://www.iwma.net)**



# Introducing EN12845 FIRE PUMP LINE

Patterson Pump Ireland Ltd. specialises in the production of world class fire protection equipment around Europe.

From enquiry stage, right through design, manufacturing, installation and after sales service, Patterson Pump Ireland strives to provide a quality, reliable fire protection system, at the most competitive price.

EN12845 provides a pan-European standard for the design, installation and maintenance of automatic sprinkler systems, and encompasses the basic requirements set forth by local rules into one European Standard.

The new Patterson Pump End Suction product line is the latest addition to the Patterson Sentinel™ range. Cost effective and efficient, these will be used in fire pump packages specifically designed and built to comply with the regulations of European standard EN12845, along with other local rules.



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# Coating Protects Azerbaijan's Flame Towers

FX5120 from SHERWIN-WILLIAMS PROTECTIVE AND MARINE COATINGS' Firetex range is providing two-hour fire protection for key elements of the steel structure of the Flame Towers project in the Baku district of Azerbaijan. The structure comprises three separate 198-metre high towers; the south tower provides residential accommodation, a hotel in the north tower provides 318 rooms over 36 floors, and the west tower comprises 33,000 square metres of class A commercial office space.

Drawn from Azerbaijan's ancient history of fire worshipping, the towers were designed to act as an eternal flame for modern Baku. The goal of the project was to create a low-resolution media façade to display video content, while integrating inconspicuous lighting fixtures into existing architecture.

For more information, go to [www.sherwin.com](http://www.sherwin.com)



## New Multi-Function Detector



FIKE SAFETY TECHNOLOGY has introduced a new detector for its TWINFLEXpro intelligent 2-wire fire alarm system. The Multipoint ASD detector has all of the features and benefits of the existing detector – including seven modes of detection and optional built-in sounder – as well as what is described as: “a raft of additional features”.

The new detector includes an optional integral strobe, allowing the 2-wire installation of an advanced smoke/heat detector, sounder and strobe, in a single device. The Multipoint ASD incorporates a new advanced optical chamber for enhanced smoke detection and a simple LED in the base, which flashes when the detector head is removed. This enables users to easily identify which detector is missing even from considerable distance. Easier testing and maintenance at height is further simplified as the new head is fully compatible with the industry standard Solo Detector Tester pole.

For more information, go to [www.fikesafetytech.co.uk](http://www.fikesafetytech.co.uk)

## Copenhagen Hospital has Optical Detection

One of Copenhagen's leading hospitals has been fitted with four FIRE FIGHTING ENTERPRISES' Fireray 5000 infra-red beam smoke detectors.

The Fireray 5000 detects smoke over large areas in wide indoor spaces: the infra-red beam of a single detector spans up to 100 metres and does not suffer in high-ceilinged environments. With automatic motorised alignment and a low level controller for easy commissioning and maintenance, the Fireray 5000 makes smoke detection in places such as hospital wards, lobbies and storage areas much easier and more effective than it might be with using other technologies.



For more information, go to [www.ffeuk.com](http://www.ffeuk.com)



# 14th International Water Mist Conference

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# Entry-Level Addressable Control Panel

EATON has announced that its fire systems business has introduced an enhanced entry-level intelligent addressable control panel with a number of new features. The new CF2000GCPD can be configured for either one-loop or two-loop operation, with up to 200 addresses for each loop. It is equipped with four sounder circuits and is certified to EN54 parts two and four.

It features a graphical display providing the user with a menu-driven end-user interface. With the ability to fully support Eaton cause-and-effect programming and a wide range of easy-to-operate end user control functions, the new control panel is suitable for a variety of applications, ranging from small



warehouses to small/medium office developments as well as many small industrial applications.

The CF2000GCPD uses 'spur tolerant' soft addressing to minimise installation time and remove the potential for errors associated with many forms of manual addressing. The back box of the new control panel can be surface mounted with cable entry points in the top, bottom and rear. The mother board and power supply are mounted on a sub chassis which is easily removed to aid panel fitting. The new panel also features a comprehensive range of interface units including the CSI350 spur isolator, which permits Eaton intelligent addressable sensors to be connected to the loop as a spur.

For more information, go to [www.cooperfire.com](http://www.cooperfire.com)

## New Jockey Pump Controllers



EATON has announced the release of the XTJP across-the-line, and XTJY Wye Delta (Star-Delta) microprocessor based jockey pump controllers. Equipped with an 89mm QVGA colour touchscreen, the XTJP and XTJY units incorporate features and functions such as built in hand-off-auto buttons, programmable timers, inputs, relay outputs and virtual LED's.

An intuitive menu structure makes programming easy, while providing system information not previously available from other jockey pump controllers. Language preference is user selectable within the programming menu structure. System parameters, statistics

and diagnostics can be programmed or displayed on the front display panel, and can be downloaded via the USB Port on the rear of the microprocessor case or by an optional front panel USB port. Since all units are equipped to accept supply voltages from 200 to 600VAC (3 phase) and 110 to 240VAC (Single phase) by wiring directly to the unit, primary and secondary fusing as well as the control transformer are not required.

All XTJP and XTJY jockey pump controllers meet or exceed the requirements of UL 508 and U.B.C./C.B.C. seismic standards, are approved by the Canadian Standards Association, [New York Department of Buildings, and meet CE mark requirements.

For more information, go to [www.eaton.com](http://www.eaton.com)

## EN54-23 Compliant Visual Alarm Devices

HOCHIKI EUROPE has announced the imminent release of a full range of EN54-23 compliant Visual Alarm Devices (VADs) including base sounder beacons, wall sounder beacons and ceiling beacons, all of which are loop-powered.

The new wall and ceiling beacons are available with either red or white LEDs that provide the installer with additional flexibility when deciding on the requirements of each installation. The brightness of the LEDs can be adjusted on these models from the control panel (dependent on control panel compatibility), and this can reduce the number of devices an installer is required to stock, as each one can produce up to three different ratings.

The circuitry in the new wall and ceiling beacons is also continually monitored to ensure that it is still functioning. When in operation, LED light output is monitored via a separate sensor to ensure that a flash occurs, saving time on scheduled walk tests during maintenance procedures.

The new beacons have the ability to be powered externally from a separate 24V power supply, which means that for projects requiring multiple VADs, the loop current will be less affected by the LEDs when they are activated – and therefore more devices can be placed on the loop.

For more information, go to [www.hochikieurope.com](http://www.hochikieurope.com)



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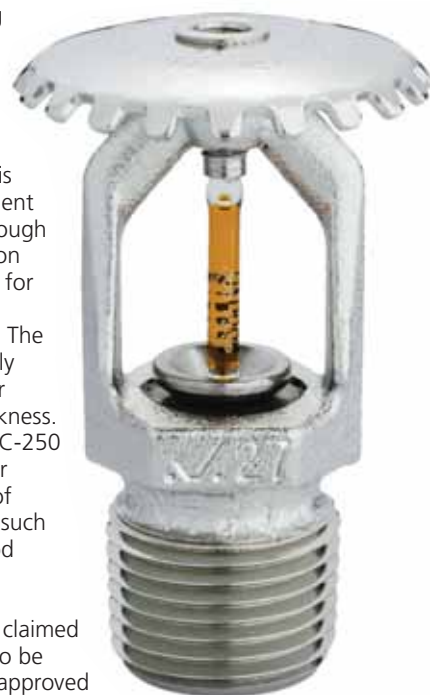


[www.e2s.com](http://www.e2s.com)

# Sprinkler Gets Corrosion Protection

Mechanical pipe-joining and fire protection systems manufacturer, VICTAULIC, has introduced VC-250 coating for its FireLock sprinklers. The VC-250 is claimed to deliver excellent corrosion resistance through a proprietary composition and application process for use across a variety of corrosive environments. The coating is applied to fully encompass the sprinkler frame at a uniform thickness.

Sprinklers with the VC-250 coating are designed for service in a wide array of corrosive environments such as water treatment, food manufacturing, ethanol production and pickling stainless steel lines. It is claimed to be the only coating to be both UL Listed and FM approved for corrosion resistance, while VdS and LPCB have recognised and approved VC-250 as an alternate coating. It tested visually suitable for most corrosive applications including acetic acid, ammonia, sulphur dioxide and ammonium submerged.



For more information, go to [victaulicfire.com](http://victaulicfire.com)

# Passive Protection Guide

The ASSOCIATION FOR SPECIALIST FIRE PROTECTION (ASFP) has published the 2nd edition of its *Best Practice Guide in Passive Fire Protection*, which contains comprehensive information about the installation, specification, commissioning and purchasing of passive fire protection.

The Guide defines the roles and responsibilities of professionals with responsibility for the fire safety of a building throughout its lifecycle, from design, through to occupation. It includes advice for the client/developer, designers, main and specialist contractors, manufacturers, suppliers, regulators and enforcers, as well as the building occupier. Three major sections offer in-depth guidance on designing for passive fire protection; constructing, supplying and installing passive fire protection products; and maintaining passive fire protection.

For more information, go to [www.asfp.associationhouse.org.uk](http://www.asfp.associationhouse.org.uk)



# Water Mist Protection for Timber Building

MARIOFF's Hi-Fog has been selected to protect Europe's largest, multi-story timber residential building, a seven-story, energy-neutral residential building with 186 apartments with a total floor area of more than 10,000 square meters, and an underground parking area for 80 cars. While the combustibility of timber limits its use as a construction material in most countries, Finland's national building regulations permit the construction of three- to eight-story timber-frame residential buildings as long as an automatic sprinkler system is installed throughout.

For more information, go to [www.marioff.com](http://www.marioff.com)



# Linear Protection for Irish Tank Farm



PATOL has supplied specialist fire detection products for eight storage tanks at the Corrib gas project in Ireland, operated by Shell E & P Ireland Limited (SEPI). The Corrib development has four distinct parts, one of which is the Bellanaboy Bridge gas terminal where the tank protection takes the form of Patol infrared heat and flame sensors and linear heat detection cable (LHDC).

The LHDC system ensures the safe operation of electrical equipment by limiting the energy available for ignition. Many aspects of the digital LHDC system – from the automatic cable reel down to the clips specified for fixing the cable – were adapted and modified for the project.

Patol, which claims to be currently the only LHDC manufacturer capable of supplying a SIL2-certified system specifically designed for use in the petroleum, oil and gas industry, also supplied a custom-built SIL2-approved control panel for the Corrib Gas project.

For more information, go to [www.patol.co.uk](http://www.patol.co.uk)



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# Tyne Tunnels Protection

ADVANCED's MxPro 4 fire panels and ExGo extinguishing control panels was chosen to protect one of the UK's busiest river crossings, the Tyne Tunnels, which experiences over 14.5 million vehicle journeys every year. The project covered the administration buildings, ticket plazas, extraction and service buildings and the two tunnels themselves, including the crucial safety corridors.

MxPro is Advanced's flagship range of multiprotocol panels, offering customers a choice of two panel ranges, four detector protocols and a completely open installer network. MxPro panels can be used in single loop, single panel format or configured into high speed, 200 panel networks covering huge areas.

The ExGo extinguishant release system was configured and installed in key service buildings for both tunnels. The ExGo range has been developed



specifically for sensitive and strategic assets such as server rooms, historic attractions and critical infrastructure assets

where gas extinguishing is required. The main control panel can be supplemented by remote terminals and up to seven remote status indicators for each panel. ExGo is fully compliant with relevant EN54 fire standards (Parts 2, 4 and 13) and EN12094-1 extinguishing standards.

In total, the network installed at the complex comprises eight MxPro 4 fire panels, four 50-way network I/O cards, two BMS Interface modules and two MX-4020 repeater panels, all connected by a fault tolerant fibre optic network. The system is connected to zonal LED mimics at the entry and exit points of the tunnels to communicate alerts directly to emergency service personnel and uses over 900 additional components. The fire system is linked to the ExGo panels, which are installed in the service buildings.

For more information, go to [www.advancedco.com](http://www.advancedco.com)

## Passive Tunnel Protection

MORGAN ADVANCED MATERIALS has launched a high-performance sprayed refractory cement product for fire protection that is said to offer superior fire protection and simple, cost-effective installation. FireMaster FireBarrier 135 is ideal for concrete tunnel lining fire protection and the fire protection of ventilation shafts, escape tunnels and refuges, as well as critical systems such as water mains and communication cables.

FireMaster FireBarrier 135 has been specially developed to cope with the high temperatures that may occur in tunnel fires; it can withstand repeated and prolonged exposure to high temperatures. It can be installed onto concrete or metal substrates using standard spray equipment with very low spraying wastage during installation, while its single-layer application makes it rapid and easy to install. It adheres to most construction materials and can be installed quickly, helping to reduce labour costs while maintaining the final product's quality and proven reliability.

The material has extremely high adhesion strength – typically eight times its weight, allowing fixings to be attached directly to it. It can be trowelled flat to provide a high-quality surface finish that can be used as the final tunnel lining surface (with optional painting), avoiding the need for secondary cladding. It can also be cast into sheet form and installed as a dry board or shape for applications where spraying is not convenient. Capable of resisting the environmental conditions found in tunnels, the material is also resistant to water jet sprays used to clean tunnel lining, and will not spall when subjected to water hose sprays at high temperature, increasing firefighting safety.

For more information, go to [www.morganthermalceramics.com/firemaster/](http://www.morganthermalceramics.com/firemaster/)

## Alarm Management Platform Update

DRAX TECHNOLOGY has launched the AMX 2.17, an updated version of the AMX alarm management platform, which supports a wider range of fire control panels.

AMX 2.17 is now Windows 8 compatible and supports virtually all leading fire control panels with the addition of the ADT

MX/ZX, C-Tec, Kidde Vega and Morley DX Connexion systems. It provides a real-time view of the status and performance of all connected devices and enables faults to be identified rapidly across the network without having to physically check each remote control panel. The system also allows individual devices to be isolated remotely in the event of building work or other activities that occur in a specific zone to eliminate the incidence of false alarms.

The system's synchronisation capabilities have also been enhanced to improve operational efficiency. AMX 2.17 now allows clocks in remote fire alarms and connected devices to be synchronised to ensure that reports and event logs are more accurate. Also, when multiple AMX workstations are connected as part of a group, they are synchronised to ensure that a single data set is used to simplify future reporting.



For more information, go to [www.draxtechnology.com](http://www.draxtechnology.com)

# Freedor

## The Innovative Wireless Free-Swing Door Closer

Fireco's Freedor is a unique solution to solve the common problem of fire doors being wedged open, rendering them useless in the event of a fire. Using patented acoustic technology, the Freedor is easily installed at the top of a fire door, enabling the door to be safely kept open. The device continually 'listens out' for the sound of a fire alarm and then automatically closes the door, protecting those behind it from the dangerous spread of smoke and fire.

**F**reedor is a wireless, electrically powered free-swing door closer. The device listens for a fire alarm meeting or exceeding 65dBA. This must sound for longer than 14 seconds in order for the door to automatically close.

The innovative product operates up to power size three (60kg fire door) and takes the weight out of the door, making hefty fire doors easier to open and close. Freedor can also be adjusted in terms of the closing speed, sensitivity and latching angle. Users can also be assured that the battery life will survive

accident inquiry conclusion for this case listed a catalogue of precautions that could have helped prevent the fire becoming so destructive. One of these precautions was for all bedroom doors to have door closers and smoke seals fitted to them.

The Fireco product 'Dorgard' was actually quoted in the trial of this case as it offers a solution, as does the award-winning 'Freedor'. Installing a free-swing door closer such as Freedor on each fire door will allow the door to safely be kept



for 12 to 18 months. For further assurances, Freedor has been designed to comply with BS EN 1154, BS EN 1155 and BS 7273-4 category B.

The popular Freedor picked up both a British Engineering Excellence Award and a Fire Excellence Award in 2011.

### Regulation

According to UK Government's building regulations (Approved Document B), all fire doors should be fitted with a self-closing device. Fire doors are installed to protect the safety of building occupants by preventing the spread of smoke and fire, provided they are closed. In this way they make sure people have a secure route to get out of the building, while protecting the building and its contents against the spread of damage.

### Shut that door!

Wedging open a fire door can prove devastating, as the case of the Rosepark Nursing Home in South Lanarkshire in the UK showed. A fire broke out at Rosepark in a cupboard on 31 January 2004 and ripped through the building. The fatal

open, but rest assured that the door will automatically shut when a fire alarm sounds, using Fireco's patented acoustic technology. Freedor will soon be even more affordable with an exclusive supply-only line for trade customers to install themselves, available later this year.

### Ideal buildings for Freedor

Freedor is an ideal product for any building that has one or more fire doors. Studies suggest that the greatest fire risks are found in multi-occupancy properties that have three or more storeys. This includes hostels, managed or sheltered accommodation such as care homes, houses that are converted into flats, purpose built multi-storey buildings and flats above shops.

### Join the 'Wedge Pledge'

Doors are one of the most important fire safety features in a building and also, sadly, the most commonly abused. Research carried out by Fireco showed that in 64 percent of premises visited, the fire service found fire doors wedged open.

Help Fireco kick the wedge for good by joining the 'Wedge Pledge' today! Tweet a picture of any wedged open fire door to @Fireco with the hash tag #wedgepledge. Pictures sent will be shared via Twitter and Facebook to highlight how widely spread the problem really is.

**IFP**

For more information, go to [www.firecoltd.com](http://www.firecoltd.com)

# Olympia Electronics – Analogue Addressable Fire Detection Systems

Analogue addressable fire detection systems are fire detection systems where sensors give analog signals for the phenomenon that they detect. The panel recognises the exact point of every device.

The selection of a suitable fire detection system essentially begins with the selection of the panel. Without any general rules to adhere to, the total size of the area, its usage, the construction materials and certain special requirements are factors that influence the size and type of the panel.

If we select a conventional system we begin by dividing the area into zones, taking care that:

- Each zone does not have an area greater than 2000 square metres.
- Each zone contains a clearly defined area, for example a floor level.
- The total electrical capability of the zone is not exceeded.
- The point of the fire can easily be located by someone that is in the vicinity of the zone.

If the required zones do not exceed six, and there is no need for future expansion of the system, then we can select BS-632, BS-634 or BS-636 panels. If the total zone requirements are greater, we select the expandable BS-116 fire detection panel with a BS-114 keyboard. This panel gives us the capability to design a system with as many zones as we require by adding more BS-116 panels in a network.

In very large areas, where it is required that the panel shows information on the exact location of the sensors that are activated, we must select an addressable system with one or more loops depending on the total covered area. Each loop has specific capacity (191 or 240 devices, depending on the system) and can theoretically cover approximately 5000 square metres. All the devices on the loop are connected on a 2-wire hook-up arrangement by which they are powered and communicate with the panel. In order to prevent a fault from disrupting the operation of the whole loop, line isolators are placed periodically between the detectors and the call points.

## Product Description

- Addressable fire detection products are produced in accordance with EN54-2, EN54-4.
- There are 32, 64, or 96 zone capability for panels that are **LPCB certified**.
- The mains power supply is 220-240V AC.
- It offers two or four fully monitored siren outputs with a rating of 24V/0.5A and six programmable relays, as well as a built-in network circuit.
- Incorporates a power supply with a rating of 24V/100W and built-in battery charger for 24V batteries with a capacity of up-to 12Ah.
- The panels offer an extensive list of adjust-



ments and characteristics for the control of the installed devices and sirens. These parameters can easily be adjusted using a PC-based program.

- The programming of the panel can also be done using a PC.
- Messages can be viewed on the big LCD (320x240 pixels) whereas LEDs are used to show basic operations such as alarms, faults and isolated sections.
- The operation is done using the built-in 16-key keypad.
- There is also an incorporated safety lock and a thermal printer mounting position.
- The maximum delay for the sirens is 4 minutes.

## Peripherals

- **Siren with Beacon, 100db**  
BSR-5031. Siren (IP42) for fire detection control panel.
- **Fire Detection Call Point**  
BSR-5036/A. Addressable call point. When activated, this call point informs the panel of the precise location of the event while simultaneously lighting the incorporated LED. It has micro-switches that are used to set the address.
- **Optical Smoke Detector**  
BSR-6055/A. Addressable optical smoke sensor. It has an internal "smart" chamber with a special transmitter and receiver. The sensor continuously sends digital information to the panel regarding the quantity of the smoke. The panel, using special algorithms, decides when to issue the alarm. The sensor has a special connection base and micro-switches that are used to set the address.
- **Remote Detector LED**  
BSR-5072 is a remote indicator LED that is integrated with any addressable detector. It is installed away from the detector and lights up when a detector is activated.

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# Bilge Area Fire Figh



In 2005 The International Maritime Organisation (IMO) published the revised guidelines IMO MSC/Circ. 1165 for equivalent water-based fire-extinguishing systems as referred to in SOLAS 74 for machinery spaces and cargo pump-rooms. By this amendment the existing MSC/Circ. 668, as amended by MSC/Circ. 728, was given a life time that expired in 2010. The new version for testing systems that are equivalent to that referred to in Solas Regulation II-2/12 has modification for the testing of systems in that tests specific for bilge area were implemented as mandatory.

**B**efore 2005 virtually no manufacturers tested for bilge area protection, as bilges up to 750mm were normally not protected with separate bilge nozzles. However, in 2005 Danfoss Semco A/S conducted fire tests for bilge areas in accordance with the new test method described in IMO/MSC 1165. At that time the normal bilge height was 750mm, which was chosen for the test. Based on this Danfoss Semco was able to obtain formally approved bilge area protection with water mist nozzles. Besides this, the normal practice with bilges higher than 750mm, was to treat them as part of the engine room. Recently the new rules led to a change in practice that bilge area protection was required for all bilges and the manufacturer can only protect bilge areas up to the height for which they have an approval.

Danfoss Semco has recently finalised large scale fire test with water mist nozzles for bilge areas in

accordance with these new guidelines and have obtained type approval from the maritime classes.

In order to get the optimal solution Danfoss Semco has developed a new nozzle that uses only water for extinguishing the three classification tests for fires in the bilge area. The classification tests comprise fire in pools located beneath an engine mock-up and consist of flammable liquid that is 0.5 square metres of heptane, 0.5 square metres of lubrication oil and 4 square metres of diesel.

All Danfoss Semco's nozzles are drawn in 3D, which means that generating the production material is easier as this can be done directly from the 3D model. Even prototype nozzles are modelled in 3D. The spray pattern of the modelled nozzles is then implemented into a 3D model of the fire scenario of the enclosure and combustibles. By doing this the cost of developing new

# ting with Water Mist

nozzles has been decreased as has the lead time from prototype to final approved nozzle. During the fire performance testing several parameters were recorded, such as temperature, damage due to the fire and time to extinguishment. These parameters serve as basis for developing of new nozzles and are used when modelling new nozzles.

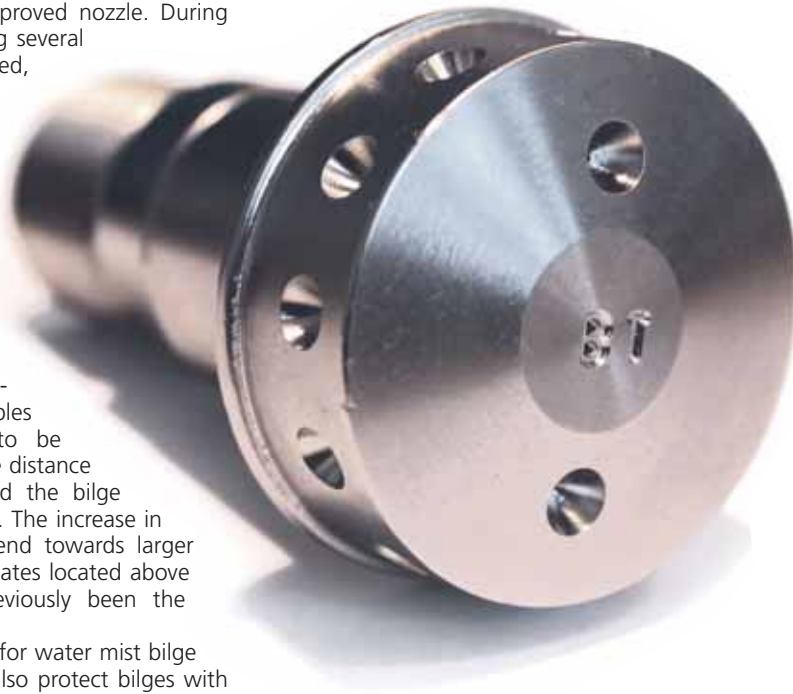
The new nozzles can protect bilges that are up to 1.5 metres high, which currently is the highest on the market. This enables Danfoss Semco nozzles to be installed in bilges where the distance between the tank top and the bilge plates are up to 1.5 metres. The increase in height would meet the trend towards larger engine rooms, with bilge plates located above 0.75 metres that has previously been the benchmark.

Besides the new nozzles for water mist bilge areas Danfoss Semco can also protect bilges with the same height with nozzles using 1% AFFF foam additive. This means that the yard or owner can chose between water only or foam for the protection of bilge areas with height of up to 1.5 metres. In both cases the above mentioned classification fires were extinguished with very convincing results as, for example, the two oil test fires were extinguished faster than one minute after activation of the Sem Safe system.

With these new nozzles, Danfoss Semco can supply nozzles with type approvals in accordance with the current regulation, as well as machinery spaces with higher bilges. This is positive for all Danfoss Semco customers since they still can trust Danfoss Semco as a total solution provider of fixed firefighting equipment that is innovative in developing new products to meet tomorrows demand. The new type approvals could be a competitive solution for Danfoss Semco as no other manufacturer has yet invested in the new approvals for bilges at the same height for water mist nozzles without additives.

If the ship owner or the yard wants to have a solution with foam additives for bilge area protection, this can also be provided by Danfoss Semco. The approvals for the Sem-Foam system is also for bilges that is up to 1.5 metres in height. This gives the benefit that the yard does not have to remember all kinds of different heights for bilges as the two systems are approved for the same height.

Compared to competitors, the new Danfoss Semco nozzle uses approximately 14 percent less water than comparable nozzles on the market, while still extinguishing the fire with a reasonable margin. As a result of large spacing and low water consumption for the bilge area protection, the yard will experience lower cost for the installation. The installation cost are even reduced further since



the nozzles are easy to mount as a normal pendant nozzle, so the installer does not have to install nozzles in a certain angle as most manufacturers have in their type approvals. The inclinations have been introduced in order to extinguish the fires where Danfoss Semco instead implemented this into our nozzle design resulting in nozzles that can provide water spraying almost horizontally. For other application such as parking garages we developed the first upright nozzle that sprays down wards, meaning that inside the nozzle the flow direction is reversed before it is distributed out of the nozzle.

One advantage of using water without additives is associated with the cost involved with a foam additive. Some maritime classification societies require full scale testing of the system after installation to see that the water mist can cover the entire machinery enclosure including the bilge area. For foam systems they require that the foam additive is part of this large scale testing. By adding the foam, the yard will add more costs for cleaning compared to if only water was used. Furthermore the owner has to monitor the shelf life of the foam concentrate and has to include the cost for regularly changing of foam concentrates during the operation of the ship.

In order to ensure the very best quality of all of our nozzles, we have chosen to make flow test of every single nozzle as part of internal quality management system. This means that we are certain that the delivered nozzle from our production all give the specified nominal flow which is the same flow as for the nozzles that passed the large scale fire testing. For other than the open bilge nozzles, for example, glass bulb operated nozzles, a leakage test is conducted on every glass bulb nozzle where all are subjected to a pressure test.

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# Safeguarding our Heritage



The protection of historic buildings is unlike that required by most other types of building. In some cases the objective is to preserve the structure itself, sometimes the invaluable works of art or other items of historical significance are of most concern, and often it is both. Thus, the art of preserving heritage sites needs to find fire protection solutions that are consistent with their particular needs: fast and reliable detection at an early stage of the fire, minimum installation requirements – possibly without cabling – and automatic extinguishing with tailored agents that do not harm the valuables.

Simple compliance with mandatory building codes does not necessarily provide adequate fire protection, particularly in terms of irreplaceable asset and value protection. Heritage sites such as castles, churches, museums or libraries therefore require specific measures as they feature specific challenges. For example, the often ancient structure of the building has to be kept intact. In contrast to modern buildings, historic premises often lack compartmentation, which would help facilitate fire protection, and adequate escape routes are missing in the majority. Paintings, historic furniture, tapestries, wall hangings, carpets and wooden parquet floors, as well as other combustible materials, add to a high fire load. And, in addition to all these challenges, the safety and integrity of occupants and visitors must, of course, be guaranteed at all times.

As many historic buildings are designated as World Cultural Heritage sites, the particular desire to preserve the aesthetic look and feel is an important additional challenge; the integrity of irreplaceable interior architectural details such as unique wall decorations, stuccoed ceilings and frescoes are of significant importance, both to the owners

and custodians of these buildings and to the public who seek to enjoy them.

These particular challenges presented by historic buildings increase the demand for innovative fire safety systems that can combine modern fire safety requirements with the goals of historic character preservation. A combination of high performance detection and automatic extinguishing from systems that do not impact too overtly on the aesthetics of the environment they are protecting is the answer.

## Preserving Aesthetic Premises without Compromising Fire Safety

Wireless technology is widely adopted in such applications, given the aesthetic issue with cabling, and the wireless fire safety system Swing from Siemens is one of the most advanced wireless systems to be used in heritage applications: while offering great freedom in detector placement, it also features the unique ASA technology (Advanced Signal Analysis) that eliminates false alarms and provides very early detection to protect people and historical assets.

Swing also offers fast and highly reliable



detection, with the detector featuring two optical and two heat sensors. ASAt technology allows the detector to be optimally adapted to its environment by choosing an application-specific parameter set. This means the detector is immune to deceptive phenomena such as dust or special effects as may be used in theatres, thereby preventing false alarms.

The Swing system is based on wireless mesh technology, which maximises communications redundancy and so matches the security and reliability of a cable-based solution. Within the mesh network, each wireless device communicates with the adjacent devices, which means that at least two redundant paths are available at any time for transmitting information.

To further increase reliability, each device has two frequency bands with multiple channels. If a detector fails, the network "repairs" itself by automatically changing channels and/or frequency bands or forwarding information via an adjacent device. This ensures that information always reaches the gateway and ultimately the fire control panel, providing maximum system availability at all times. With its grid-like communication pattern, the mesh technology is also especially helpful to overcome obstacles like very thick walls as often found in historic buildings.

Another benefit of mesh technology becomes apparent when setting up large wireless networks. Since each fire detector communicates with its neighbours, the central gateway no longer has to be in direct radio contact with each detector. Using a single gateway, a network can be installed in a radius of up to 90 meters and, dependent on local regulations, spanning up to five floors.

### Sensors Smell Smoke – and React Fast

For highly ornate applications, such as artistically decorated walls and ceilings, another type of detection is available. Aspirating smoke detection (ASD) is used to provide what is effectively invisible fire protection. ASD uses pipes that can be hidden in ceiling voids, with the detectors sampling the air for the presence of smoke particles, reacting early and reliably in the event of a fire and well before active flaming occurs.

This is a significant advantage when looking to minimise the impact on decorative features in historic buildings. ASD is an ideal smoke detection method for a wide range of heritage buildings, including churches, cathedrals, libraries and any building characterised by high ceilings and large open areas. Such applications will frequently lead to smoke stratification because smoke from a small fire lacks sufficient thermal buoyancy to reach high ceiling mounted beam type or conventional detectors. ASD from Siemens uses innovative optical dual-wavelength detection technology which offers early warning of fire

while also ensuring high immunity to deceptive phenomena.

### Automatic Extinguishing Keeps Irreplaceable Artwork Safe

Turning to fire extinguishing methods, automatic sprinkler systems are often installed to protect the building structure. While water can be an issue in potentially damaging historic collections, sprinklers often do their job, however only to protect the structure and preventing the fire to spread to other buildings. Therefore, a detection system that provides an early and reliable alarm is essential.

For applications where water is an issue it actually makes sense to combine or even replace the sprinklers with an automated extinguishing portfolio such as Sinorix from Siemens that features clean agents that leave no residue and do no harm to people or assets. This highly sophisticated extinguishing system offers a broad spectrum of solutions that can be precisely tailored to the fire protection requirements of any given application in historic sites, such as archives, libraries, electrical rooms or server rooms. The Sinorix portfolio includes extinguishing solutions for every need and application. Furthermore easy solutions with hardly any installation effort are available with Sinorix Compact, a preassembled fire detection and extinguishing product for small rooms up to 130 cubic metres.

### Matching the Technology with the Risk

Historic buildings, certainly the larger ones, will often have a number of different rooms with a range of uses: theatres, exhibition spaces, archives and libraries are just a few examples. It is therefore important to employ a solutions provider that has experience of the different fire safety challenges that these present, with a portfolio of products that allows the protection to be matched to the specific requirements.

Siemens has both the experience and the comprehensive product range to provide an intelligent approach to fire safety in historic buildings: to protect the people, the unique structures, the irreplaceable values and, ultimately, the heritage that they represent.

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For further information, go to  
[www.siemens.com](http://www.siemens.com)



The background of the advertisement is a photograph showing a large number of pigeons in flight against a clear, bright blue sky. The pigeons are captured in various stages of their wing strokes, creating a sense of dynamic movement. On the right side of the image, the corner and upper part of a classical building are visible, featuring ornate architectural details and a light-colored stone or plaster finish. The overall composition suggests a theme of freedom and safety, which is reinforced by the text.

SIEMENS

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# SWING – being safe, feeling free

Wireless technology for maximum life safety and flexibility

Radio fire detection is the ideal solution for rooms or buildings of historical value, with aesthetic or architectural restrictions or for temporary installations. Thanks to wireless technology, devices can be quickly and freely positioned and repositioned. This facilitates planning, allows for cost-efficient installation and offers a high level of freedom and flexibility should room usage or building structure change in the future.

SWING is the first radio fire detection system on the market that uses the innovative mesh technology instead of the conventional star topology, ensuring safe wireless communication with at least two redundant communication paths. Furthermore, thanks to the unique deception-free **ASA** technology™ from Siemens, the SWING detector can be optimally adapted to the current environmental condition by simply choosing the application-specific ASA parameter set. This makes the detector the optimal solution for any application – and also ensures highest life safety.

Answers for infrastructure and cities.

# Complete Solutions from Kingspan Tarec

Limiting the spread of smoke and fire is a key consideration for any building owner, and in order to do this effectively, thought needs to be given to every aspect of the design and specification, including building services. Using pipe insulation that has a good fire rating will go a long way towards reducing the risks, but what happens with building services penetrations, which can open the way for a fire to spread?



To resolve this issue, Kingspan Tarec has recently launched the Kingspan Tarec Kooltherm FireSleeve, a slim solution that expands to several times its normal size in the event of fire. This helps to seal service penetrations, preventing the spread of fire and potentially reinstating the original fire rating of a building element.

The Kooltherm FireSleeve comprises an intumescent layer inside a stainless steel facing and is sealed at both ends with compressible rings. When exposed to high levels of heat, the intumescent swells and forms a hard char that closes any gaps between the pipework and the penetration edge. The product achieves a two-hour fire integrity rating tested to BS EN 1366 and is particularly suited for use on fire-rated constructions where inadequately sealed building service penetrations can act as a channel for smoke and flames.

To allow a straightforward installation, the 205mm Kooltherm FireSleeve features a secure clasp fastening and is supplied pre-wrapped around a 300mm section of Kingspan Tarec Kooltherm FM pipe insulation. The product is currently available in a range of sizes to fit Kooltherm FM pipe insulation installed on either steel or copper pipework. Kooltherm FM pipe insulation products and systems have a densely cross-linked structure that makes them difficult to ignite and when subjected to fire, the outer surface forms a strong carbonaceous layer that limits heat generation and retards further flame spread.

## Fire & Smoke Performance

The reaction to fire classification for Kooltherm pipe insulation is determined by its performance in the single burning item (SBI) test, which measures total heat release (THR), fire rate growth index (FIGRA) and lateral flame spread (LFS). In addition to the reaction to fire classes A to F, products subjected to the SBI test are also classified into one of three smoke production sub-classes ranging from the highest (best) class of s1 to the lowest (worst) class of s3. The final sub-classification for construction products subjected to the SBI test is for flaming droplets/particles, which is also divided up into one of three classes ranging from the highest (best) class of d0 to the lowest (worst) class of d2.

Kooltherm FM pipe insulation holds a Euroclass rating of B<sub>L</sub>-s1, d0. The subscript L on BL indicates that the fire test has been carried out on pipe insulation as placed on the market, not a flat indicative sample. This is the highest/best reaction to fire classification available to phenolic foam insulation under BS EN 14314 and represents market-leading performance.

Kooltherm FM Pipe Insulation is also FM Approved per Approval Standard Class 4924, a Flame Spread Index of ≤25 when tested to ASTM E 84, achieving Class A, and achieves results to BS 476-6 and BS 476-7 that combined enable a Class 0 classification to the Building Regulations in England and Wales, Northern Ireland and the Republic of Ireland, and a Low Risk classification to the Building Standards in Scotland.

## A Complete Solution

From premium performance pipe insulation, to insulated pipe supports and intumescent fire sleeves, Kingspan Tarec systems offer a complete solution to enhance and protect building services and their surroundings. Kingspan Tarec provides free, expert advice and guidance on everything from the latest regulatory requirements and best practice to detailed project specific advice and solutions, via its Pipeline Technical Advisory Service. **IFP**



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One complete solution,  
combining high  
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and fire protection



## Kooltherm® FireSleeves

Limiting the spread of smoke and fire is a key consideration for any building owner, and to ensure maximum protection, Kooltherm® FireSleeves provide a slim solution which expands to several times its normal size in the event of fire, helping to seal service penetrations.

Kooltherm® FireSleeves achieve a 2 hour fire integrity rating to BS EN 1366 and incorporates the superior Kooltherm® FM Pipe Insulation which holds a Euroclass rating of B<sub>L</sub>-s1, d0.

Now you can insulate your pipework using the complete Kooltherm® FM Pipe Insulation System comprising pipe insulation, insulated pipe support inserts and fire sleeves – high performance insulation combined with superior fire performance.



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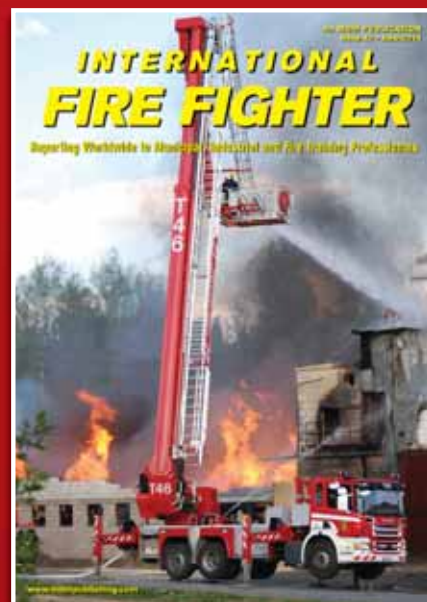




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# Clean Agents - The Long Term Solution



**Kurt Werner**

3M

A small fire in critical facilities such as data centres, oil and gas facilities, power generation and transmission facilities can result in catastrophic loss by interrupting vital operations and damaging high-value equipment. In these situations, it is important that fires be knocked down quickly – before they have a chance to spread – and that sensitive data and electronics are not damaged in the process of putting out the fire, and continuity of operations is preserved.

**3**M Novec 1230 Fire Protection Fluid is a highly-efficient fire suppression alternative to hydrofluorocarbons (HFCs) and Halons, with properties ideally suited to clean fire protection for critical assets, that is, non-conductive and leaves no residue.

## Agent Evolution

The most popular alternatives to Halon have been HFCs, including HFC-227ea (FM-200 brand). The ozone depletion potential of HFCs is zero, but they are potent greenhouse gases. For instance, the global warming potential (GWP) of HFC-227ea is 3,220, that is, 3,220 times more potent than CO<sub>2</sub> in its climate impact.

## Regulations on HFCs

It should not be a surprise that there is growing cynicism about the differing perspectives in the clean agent fire suppression market regarding the future of HFCs. For those interested in sustainable investment to protect their valuable assets, it may be helpful to add some clarity to the events unfolding in 2014.

## Europe

On March 12, 2014, the European Parliament voted to phase down use of HFCs 79 percent below average 2009 – 2012 levels by 2030. The provisions of the law begin in 2015.

Impacts of the EU Regulation on the fire suppression market include:

- 1** HFC-227ea, HFC-125, and HFC-236fa are targeted under the HFC phase-down.
- 2** HFC-23 (FE-13) will be prohibited after January 1, 2016.
- 3** 3M Novec 1230 Fire Protection Fluid is not impacted by this regulation.

Under the HFC cap and phase-down, HFC-producers will be allocated a production/import quota for HFCs and will have difficult decisions to make. Because the quota will be in CO<sub>2</sub> equivalent and HFCs sold into the fire suppression market have some of the highest GWPs, this framework does not favour HFCs sold into fire suppression. For example, an HFC producer would consume the same percentage of a quota by making either one ton of HFC-227ea, three tons of HFC-245fa, or five tons of HFC-32. This dynamic will put a substantial amount of uncertainty on the future supply and cost of HFCs sold into fire suppression.



## United States

On Tuesday, June 25, 2013 President Obama announced the release of a Climate Action Plan. Within the initiative to reduce greenhouse gas emissions, the plan proposes to reduce the use of HFCs both domestically and internationally through the Montreal Protocol. Under the plan, the U.S. Environmental Protection Agency (EPA) will also be approving climate-friendly chemicals while prohibiting certain uses of more harmful HFCs. Earlier this year, EPA announced they will propose a rule in 2014 to change the status of HFCs under SNAP.

## Waiting for the Smoke to Clear

It is clear that today's policy realities suggest a future that severely restricts or financially burdens HFCs. Novec 1230 fluid has been commercial since 2002 and is a readily available alternative to immediately replace the use of HFCs in fire suppression, enabling the industry to essentially eliminate its dependence on potent greenhouse gases.

Novec 1230 fluid has an ozone depletion potential of zero and a GWP of less than one, enabling more than 99 percent reduction in GHG emissions. This fluid has been widely used in data centres, oil and gas processing facilities, electricity generation and transmission infrastructure, museums and other valued assets where continuity of operation is paramount.

Decisions about fire protection need to be made for the long term and the type of extinguishing agent used is an important component of that decision. When total cost of ownership is part of the agent selection process, sustainable technology like Novec 1230 fluid is a solution that will last the test of time.

IFP

**Kurt Werner** is the  
Environmental Affairs  
Manager at 3M

For further information, go to  
[www.3M.com/Novec1230fluid](http://www.3M.com/Novec1230fluid)

# Stopping Fire in It



**Riley Archer**

Rectorseal

You may have heard the word firestopping thrown around the construction industry to describe any material used to prevent the spread of fire? But what is it really? A firestop is a material or combination of materials designed to re-establish the fire resistance rating of rated assemblies such as fire-rated walls, floors, and ceilings. These materials or systems are required to be fire tested and listed by an accredited, independent testing agency as proof of their performance in fire conditions.

In this edition of *International Fire Protection* we will take a close look at a number of key considerations, including testing and fire rating. Part Two of this article will appear in the December edition of the magazine.

Understanding what a firestop is, as well as where and why it is required, helps ensure that it is correctly installed. The use of firestopping is different than the use of fireproofing, fire-blocking, and firesafing, but unfortunately these terms often are confused and incorrectly used as interchangeable. Fireproofing applications deal primarily with the passive fire protection of structural steel elements of a building. These fireproofing applications also are tested by independent agencies in live fire tests and listed in resource directories. Fire-blocking is the process of installing materials to resist the free passage of flames in a building through concealed spaces. Firesafing generally refers to the fire-resistant insulation that sometimes is used as part of a firestop system.

When a fire resistance-rated assembly is penetrated or a void is created due to the inclusion of a construction joint, a firestop system must be

installed properly to reinstate the original fire-resistance rating of that assembly. Such situations occur on almost every commercial construction project. It is important to remember that firestopping is designed to perform as tested only once in its lifetime, and to do so it must be properly installed.

Passive fire protection, which encompasses firestop as well as the other materials designed to prevent the spread of fire in a building, plays a key role in protecting life safety and property by preventing the passage of flames and smoke through rated assemblies. Using fire-resistant rated assemblies and firestop systems are a basic element of passive fire protection known as compartmentation. Creating fire-rated compartments within a building by constructing and maintaining the fire-resistance ratings of wall, floor, and ceiling assemblies prevents the rapid spread of fire throughout a structure. These fire-rated compartments are



# s Tracks – Part One

constructed of rated assemblies that are tested to resist the passage of hot gases, flames, and smoke for a minimum amount of time, and the firestop systems are installed and tested in these assemblies to prevent flame spread for the same duration as the assembly itself.

## Testing

To create a firestop system, all of the materials must be installed in a rated assembly and fire tested for integrity in the exact configuration in which they will be installed. The most widely recognised third-party test agency for fire testing is Underwriters Laboratories (UL), which tests, classifies, and lists firestop systems and materials as well as numerous other products used on a daily basis.

The fire test standards used to determine the performance of the fire-stopped assemblies differ between penetration firestop applications (ASTM E814: *Standard Test Method for Fire Tests of Penetration Firestop Systems* and ANSI/UL 1479: *Standard for Fire Tests of Through-Penetration Firestops*) and construction joints (ASTM E1966: *Standard Test Method for Fire-resistive Joint Systems* and ANSI/UL 2079: *Tests for Fire Resistance of Building Joint Systems*). The ASTM and UL test standards dictate a temperature rise over time for the assemblies being tested. This time temperature curve, as it is referred to, is universally applied for all materials being tested to that particular standard no matter the agency doing the testing.

## Fire Rating

The duration of the fire exposure testing depends on the rating of the assembly construction and the desired hourly rating of the system that is being tested. For example, if a two-hour fire resistance-rated concrete floor assembly is penetrated by a metallic pipe, the desired fire duration for the firestop test would be a minimum of two hours to match the rating of the floor. This provides firestop system hourly ratings that are equal to the hourly rating of the rated assembly that is being penetrated.



## Water Hose Stream Test

Direct fire exposure and temperature measurements are not the only test criteria to which firestop systems are subjected in ASTM E814 and UL 1479 testing. The assemblies also must pass a water hose stream test. Immediately after the assemblies are removed from the test furnace, they are exposed to a 30-pounds-per-square-inch (psi) or 45-psi pressurised stream of water. The pressure level depends on the fire exposure duration. The hose stream is similar in appearance to that of a fire hose when the pass/fail test is performed. After exposure to the hose stream, if any water has passed through the assembly or any light is visible through the assembly, the tested assembly fails.

The hose stream is an extremely difficult criterion





to pass and demonstrates the overall assembly integrity after fire exposure. Only after successfully passing the fire exposure and hose stream portions of testing for penetrations can a system be listed by the testing agency as an approved firestopping method.

### Time & Temperature Ratings

Penetration fire tests provide data on the duration of time for which the assembly prevents the passage of flames, or F rating, as well as the duration of time during which the non-fire side of the assembly and penetrant reach 163°C over ambient temperature, or T rating. F and T ratings are mandatory measurements for ASTM E814 and UL 1479 testing, and every listed system will provide verification of the time in which the firestop system will prevent the passage of flames (F rating)

and a minimum pressure of 3 feet of water for duration of 72 hours. Successfully passing the water-leakage test using these test criteria provides firestop systems with a Class I W rating, allowing the system to be published with a W rating as well as an F and T rating.

Air-leakage testing is a little more involved than the W rating and requires a pressurised testing chamber onto which the fire-stopped assemblies are mounted. The L rating measures the air movement through the firestop assembly at ambient air temperature (24°C) and at a temperature elevated to 163°C above ambient (204°C). The internal air pressure within the test chamber is maintained at a constant 7.6mm of water during the testing, and the amount of air that leaks through the fire-stopped application is measured. The air-leakage rate is represented in measurements of

**A firestop is a material or combination of materials designed to re-establish the fire resistance rating of rated assemblies such as fire-rated walls, floors, and ceilings. These materials or systems are required to be fire tested and listed by an accredited, independent testing agency as proof of their performance in fire conditions.**

as a measurement of hours and the temperature (T rating) in a hourly measurement as well. The significance of the T rating is that it provides a point at which combustible materials on the non-fire side of the rated assembly will catch fire due to temperature rise. Theoretically, this temperature rise possibly may allow fire to spread from one area to another by heat only, without any actual flames passing through a rated assembly.

### Water & Air-Leakage Testing

Two optional ratings also are available through the UL 1479 test standard: a W rating, provided by a water-leakage test, and the L rating, provided by air-leakage testing.

If a firestop system is W rated, it means the system has a water-resistive seal while still maintaining the fire-resistance rating of the assembly. The water-leakage test is conducted using a mini-

cubic feet per minute per cubic foot. Ratings less than 1 L are the highest or best performing, and increasing numbers denote decreased performance, which is undesirable if you are trying to stop smoke.

Although the L and W ratings are optional when testing firestop systems, many building codes now require L ratings for smoke barrier assemblies of less than 5 cubic feet per minute per square foot, and some jurisdictions may require W rating for floor penetrations.

In the next edition of *International Fire Protection*, we will look at the code requirements for firestopping and consider their implications for installers, discuss the required protection when fire-resistant assemblies are penetrated, and learn more about smoke barriers. We will also take a close look at firestop applications, intumescent materials, sealants and firestop devices.

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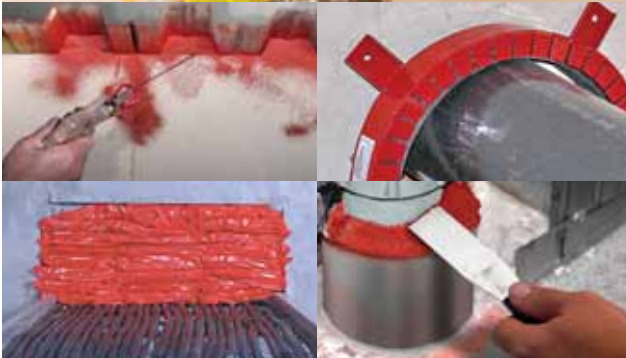
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# Latest Progress by and Water Mist in E



**Alan Brinson**

European Fire Sprinkler  
Network

European codes and standards increasingly recognise sprinklers and water mist.

Over the past decade, most European countries have introduced requirements to fit sprinklers in new high rise buildings. Most of those countries that did not already require sprinklers in shopping centres now require them there as well, and several countries now require sprinklers in large industrial buildings or warehouses. A number of countries also require sprinklers in large public buildings and in underground car parks while in Scotland they are required in schools.

Currently the most significant trend is to fit sprinklers in the places people live, since statistics show that is where most fire deaths occur. In the

Nordic countries and the United Kingdom there is now a variety of requirements and incentives to fit sprinklers in care homes, apartments and even houses. This trend is set to continue, with regulators in several European countries currently considering whether to require sprinklers in new care homes.

For decades, the United States has made the fullest use of sprinklers as a fire safety and fire protection tool but Norway has caught up and may each year now install more sprinklers for every thousand residents (almost 650,000 in 2013 for a population of five million). Since July 2010 Norway has required sprinklers in new apartment

# Sprinklers Europe

buildings, hotels, care homes and hospitals. It already required sprinklers in all new large buildings. However, in 2016 Wales will go one step further and require sprinklers in all new homes, including houses. While I have used the word "sprinkler" to describe these legislative requirements and incentives, in many jurisdictions water mist can be accepted as an alternative.

These new requirements were introduced for a variety of reasons. The high-rise, shopping centre and domestic requirements are mainly intended to prevent fire deaths and injuries, while sprinklers are required in factories and warehouses to prevent loss of employment, environmental damage, and to protect firefighters who enter to complete extinguishment.

Fire safety codes are a confusing patchwork, with each country having its own documents of varying legal status based on different conceptual approaches. To add to the complexity, many countries have different or additional requirements in their regions or cities. It is safe to say that nobody has a complete overview of fire safety codes across Europe and that to do so would require knowledge of many hundreds of documents written in more than 20 different languages.

Most of these documents are not subject to regular review so new ideas can take a long time to be introduced. Despite this challenging background, sprinklers are steadily gaining references in fire safety codes as the European Fire Sprinkler Network and its members work together to make the case for the wider use of sprinklers. Our case has been strengthened by recent research reports in the United Kingdom that show that there is an economic case for fitting sprinklers in new apartments, care homes and warehouses. Although we can explain the need for sprinklers sadly it often takes a tragic fire to trigger regulatory change.

There will be more tragic fires. Meanwhile some huge underground car park fires, fortunately without loss of life, have prompted the Amsterdam and Paris fire brigades to call for underground car parks to have sprinklers, as is already required in Germany, Italy and several other countries. The European Fire Sprinkler Network maintains an overview of sprinkler requirements in 22 different European countries on [www.eurosprinkler.org](http://www.eurosprinkler.org). If you can add to this overview I would like to hear from you!

When regulators and others call for sprinklers to be fitted in a building they usually clarify the requirement by referencing a standard. For industrial and commercial sprinkler systems we have a European standard, EN 12845, complemented by five component standard parts of EN 12259. Insurers often have additional system requirements that are set out in parallel national rules or as additions to EN 12845.

Many jurisdictions also accept designs in accordance with NFPA 13 or FM Global data sheets. The research underpinning these design

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standards is almost all performed in the United States and therefore the European documents are evolving to include new design approaches similar to those in NFPA 13 and FM Global data sheets.

A major revision of EN 12845 went to the national members of CEN a couple of months ago, which introduced early suppression fast response and control mode special application sprinklers. It also addressed excessive sprinkler clearance, provided guidance on test lines, electrical cables and third-party inspections, and updated the controversial life safety annex with a more appropriate name, "Additional measures to improve system reliability and availability". The vote is due to close in October. Meanwhile we are working on a second revision that will introduce the latest storage sprinkler technology and make it easier to

UK have published residential sprinkler system standards, drawing on the decades of experience with NFPA 13R and 13D. VdS in Germany has published a code of practice. However, this leaves all other European countries without a standard. We have therefore drafted a European residential system design, installation and maintenance standard and hope to send it to the national members of CEN for enquiry (comment) later this year. Ahead of that, a draft residential sprinkler component standard, prEN 12259-14, has already been sent to the members of CEN for enquiry. prEN 12259-14 includes the fire tests against which the existing residential sprinklers on the market were assessed in the United States, so residential sprinklers installed in Europe today are expected to comply with it.

**Most European countries have introduced requirements to fit sprinklers in new high rise buildings. Most that did not require sprinklers in shopping centres now require them, and several now require sprinklers in large industrial buildings, warehouses, large public buildings and underground car parks.**

bring in ideas from other standards. All these changes serve to make sprinkler systems more economical and reliable, so making them more attractive.

To support the new regulatory requirements and incentives to fit sprinklers in care homes, apartments and houses, the market needs standards for their design and for their key components. Residential and domestic sprinkler systems are engineered to be as economic as possible yet give occupants a hugely increased chance of survival in a fire. They achieve this by using as little water and as few sprinklers as possible, with the water preferably supplied directly from the mains.

The Nordic countries, The Netherlands and the

Water mist systems also need standards if regulators and others are to accept or specify them. In 2006 CEN published Technical Specification 14972 on the design and installation of water mist systems. This document has helped the water mist industry to develop but it does not have the status of a standard and some authorities will not use it. CEN is currently drafting a design standard, accompanied by a series of fire test protocols for different applications. In parallel it has drafted a series of water mist component standards based on existing standards for sprinkler and gaseous extinguishing system components.

All fire safety building codes in use in Europe impose limits on fire compartment areas and minimum periods of fire resistance for those



compartments. Some impose little else. A limit on a fire compartment area indirectly limits the distance anyone inside must travel to get out. It also limits the size of fire that firefighters may be asked to tackle. Fire engineers look for alternative ways to achieve an acceptable level of fire safety or fire protection and often include sprinklers in their designs. Sprinklers control or extinguish the fire, so that much less smoke and heat are produced, providing occupants more time, or even unlimited time, to get out. A smaller, controlled fire allows firefighters to approach and complete extinguishment.

Both considerations can justify a larger compartment. Outside the compartment, escape routes from the building receive less smoke and therefore need less ventilation or can be longer. Firefighters have more time to get to the fire so the building can be farther from a fire station, or more difficult to reach, or have less provision of wet or dry risers or be farther from a hydrant.

All of these ideas appear in various codes, usually with restrictions on their application. Fire engineers can combine them with other measures and analyse how a proposed building will perform in a fire at maximum occupant loading to see whether it is acceptable. Many building designs are only made possible by fitting sprinklers and many other buildings can be built more economically with sprinklers.

Fire engineering is a relatively new engineering discipline. ISO has drafted a series of standards to guide practitioners and CEN is drafting guidance to fill in the gaps. One draft CEN document sets out how to include sprinklers in a design as an alternative to the prescriptive measures found in most codes. Based on Swedish government guidance, it specifies that fire engineers should assume a constant heat release rate for fires that are larger than 5MW when the first sprinkler opens (a controlled fire) but that if the heat release rate is less than 5MW it may be assumed after a minute to begin a straight line decline by two thirds over the second minute (fire suppression).

All the above topics and more were covered in detail at Fire Sprinkler International, a major conference held in London in May this year. Jointly hosted by the European Fire Sprinkler Network and the British Automatic Fire Sprinkler Association, which is celebrating its 40th anniversary, the conference was held in the fully-sprinklered Over Tower Bridge Hotel in the City of London. Over the two days 50 expert speakers from around the world presented to 300 delegates the latest sprinkler technology, progress with standards and campaigns to secure sprinkler recognition in codes. During the breaks, delegates were able to visit over 30 stands to learn more about the exhibitors' innovative products.

Sir Edward Lister, Deputy Mayor of London, opened the conference. Each day began with plenary sessions before breaking into parallel workshop sessions where topics were addressed in depth.

The first keynote speaker was Chris Hanks, Chairman of the Fire Protection Association and a senior figure in London's insurance market, who gave the insurer's view of sprinklers. He was followed by Debbie Smith of the Building Research Establishment and Oliver Hogan of the Centre for Economics and Business Research, who presented their reports assessing the macroeconomic impact

of commercial fires, reports they recently launched at an event in the House of Commons. This reflected the conference theme of business sustainability and resilience.

Further sessions covered fire research, installer training, fire engineering, novel design concepts, water mist, building information modelling, evolving fire challenges, sprinkler standards, fire experience and analysis, pipe hanging and corrosion inhibition and measurement. There was also a presenter from Brazil who addressed the aftermath of the Santa Maria fire and a senior officer from London Fire Brigade presented its sprinkler policy and campaigns.

Complementing our conference, the next day the NFPA's Fire Protection Research Foundation held a seminar on storage fire protection. This was our 10<sup>th</sup> international fire sprinkler conference and exhibition and built on the 2012 conference in Paris.

**Alan Brinson** is Executive Director of the European Fire Sprinkler Network

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# A Warning to All

## Alerting Deaf and Hard-of-Hearing People in an Emergency



**Steve Martin**

Eaton's Fulleon business

Being able to warn everyone of an emergency in or around a building is an important principle for any fire alarm system and needs to be carefully considered at an early stage. Awareness of the challenges of specifically alerting deaf and hard-of-hearing people of an emergency is gaining momentum, especially now that the UK's EA (Equalities Act) and other related legislation have come into play.

**A**t first glance, the issues may seem straight forward, as a number of solutions are now commercially available. However, on taking a more detailed look at the different scenarios that may be encountered in every-day-life there soon emerges a deeper appreciation of some of the issues that need to be considered before committing to a final solution.

When it comes to alerting deaf or hard-of-hearing people, consideration needs to be given to the number of people that are estimated to be involved. There are estimated to be almost eight million deaf or hard-of-hearing people in the UK alone, with almost 800,000 of these being categorised as having 'severe to profound deafness'. This is a significant number of people, so any solution needs to consider this and not be a half-thought through token solution that caters for the few.

Most of the risks are encountered when a deaf or hard-of-hearing person is alone and cannot rely on others to warn them of an emergency. This risk

applies to even short periods of time, as minutes or even seconds can make all the difference in an evacuation.

The risk of not hearing an audible alarm is not only an issue for people with hearing difficulties. It is also true of people with adequate hearing, who are present in noisy environments such as factories or when the intended recipient is wearing ear defenders or headphones wired to portable music devices. There are also situations where audible alarms would not be suitable, such as in operating theatres or recording studios.

### Choosing the Right Solution

There are many off-the-shelf solutions that provide an alternative to the traditional audible alarm device; the most common are VADs (Visual Alarm Devices – flashing beacons) or tactile devices, such as pagers or vibrating pillows or beds.

Each of these technologies has its advantages and shortcomings and each one has to be weighed-up against the perceived risk. The start of

any such decision process is usually a risk assessment and if it is an existing building this is a legal requirement in the UK under the Regulatory Reform (Fire Safety) Order. Where new buildings are concerned, building regulations along with the relevant BS & EN standards (such as BS5839-1 and BS8300) are used, along with accepted custom and practice.

Consideration when choosing a solution must be based on effectiveness and convenience. Other factors such as installation time and cost are also highly important. The fitting of VADs in the form of beacons has been considered to be 'custom and practice' in the fire industry for a number of decades. They offer a solution that can better mirror that of audible devices, since they are generally mounted directly to the building and do not require any reoccurring direct intervention by the intended recipient. Regular maintenance and testing would be down to the owner or operator of the building.

Up until now, the performance of beacons has been left to personal judgment by the system designer and was often based on current consumption or joule rating. However, this gave little indication to the actual performance or effectiveness of the device once installed. This has since changed, now that the co-existence period for EN 54-23 has ended (Fire alarm devices – Visual alarm devices). VADs are now a mandatory requirement within the EU, if they are used as a primary alarm for drawing attention during a fire alarm emergency. This means that a VADs performance is now specified to a defined standard that is based on a category of Wall, Ceiling or Open and a minimum coverage volume, based on an illumination of  $0.4\text{lm}^2$ . As a result, this will make it easier to compare devices from different manufacturers, and should result in a more consistent and effective performance once installed.

The toughest challenge has been for manufacturers to achieve the increased practical coverage volume with a minimum current consumption, thus reducing the impact on control panels and wiring. This challenge has been addressed and has propelled the industry to up its game on visual device design and implementation.

The chosen location of VADs needs to be



furniture are moved after installation, thus causing 'blind spots' in the coverage. The new COP 0001 (Code of practice – Visual alarm devices used for fire alarm warning) aids the design of fire alarm systems using visual alarm devices, and aims to improve on the coverage presently achieved with existing systems.

Another issue that may need consideration is people who suffer from epilepsy, although the number of people who actually suffer from the photosensitive condition is extremely rare, being only 5 percent of people who suffer from epilepsy as a whole. The risk is further reduced to negligible levels if all beacons visible from a view point flash within the rates stated in EN 54-23, that is, below

**Most of the risks are encountered when a deaf or hard-of-hearing person is alone and cannot rely on others to warn them. This applies to even short periods of time, as minutes or even seconds can make all the difference in an evacuation.**

thought through carefully. Who is the intended target, and are they likely to benefit from the signal? If the signal is intended to be for a deaf or hard-of hearing person, are they likely to be on their own? Is a deaf person likely to use sanitary accommodation designated as a 'disabled toilet' exclusively, for example, or would they also use the regular sanitary facilities provided for others? If VADs are located wisely following a risk assessment their impact on the control panel and wiring can be minimised.

Some difficulties might arise if a building usage changes significantly, or if a number of items of

2Hz. Research has shown that for the very rare occasions where people with photosensitive epilepsy are affected, it is usually with visually changing frequencies between 16Hz and 25Hz. Synchronisation between visible flashing beacons is also important and this can easily be achieved by using either a bespoke external trigger for cross-zone synchronisation, or an integrated solution such as Eaton's 'Phase synch start' feature, built into all LX VAD products.

#### Getting a Good Vibe?

Portable tactile devices such as pagers are some-





times talked about as being a favourable alternative to VADs. At first glance, this may appear to be the case, particularly from the designer's and installer's point of view, since less consideration needs to be given to the building and room layout. Indeed, pagers can be carried from room to room, so giving constant reassurance to the user. However, there are practical difficulties with some tactile devices that should be thoroughly understood before considering them as a suitable alternative.

For example, are people fully aware of their own hearing limitations in the first place? Most of us, who are getting on in years may not like to admit that our hearing is not what it used to be, especially those, like myself, who liked to listen to loud music in their distant youth. A problem arises if a person is not aware of their own potential hearing loss, as they will not implement a personal solution to a problem that they do not perceive exists. Thus a well-designed fire alarm system with integrated VADs, signalling to all occupants of a building – whether they recognise their hearing loss or not – may be favourable.

For a tactile device such as a pager to be effective, it needs to rely on constant body contact.

Missing a mobile telephone call by not 'feeling' the vibration is one thing, but losing physical contact with a lifesaving pager is quite another. Loose fitting clothing or removing an item of clothing to which the device is attached is a real issue. Questions about what happens when a person using a tactile device disrobes to have a shower or bath needs to be answered. Even when people are aware of the need to use a tactile device, are they likely to take unnecessary risks when practical day-to-day situations arise that may require that they remove the device, such as in a sauna or swimming baths?

Are all users of portable tactile devices conscientious enough to be aware of the risks of not replacing a battery for example? We have all heard of cases where people have innocently removed a failing battery from a domestic smoke alarm, with very good intentions to replace it, but do not actually get around to it for several weeks. Even a short down time can have serious consequences in an emergency.

Clearly, the successful use of personal tactile devices requires a great deal of user responsibility and education as to their correct use and limitations.

## A flash of Inspiration

The best approach is to use the appropriate device for a given situation having weighed up all the risks. Pagers may comple-

ment a fixed system using VADs, but it could be argued that they would not replace them. Flashing beacons are a well-established form of warning of an emergency and are familiar to designers, installers and users alike. Being fixed to the building, they are under the control of the building operator rather than the intended recipient. Ultimately, one visual alarm device can signal to all recipients within a given range, unlike a pager that is a personal signalling device.

Implementing a solution that is appropriate for the particular circumstances would better fit with the spirit of the Equalities Act; that of not treating people with disabilities 'less favourably' than able bodied people.

Looking carefully at the use of a building and some of the practicalities surrounding its use, should give a better understanding of the best technology to implement, for the safety and convenience of its occupants. Visual alarm devices are familiar products that are well established in the fire industry, and the new EN 54-23 standard along with the COP 0001 Code of Practice, will further enhance the use of visual alarm devices in situations where alternatives are not suitable or practical.

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**Steve Martin** is Product Manager at Eaton's Fullerton business

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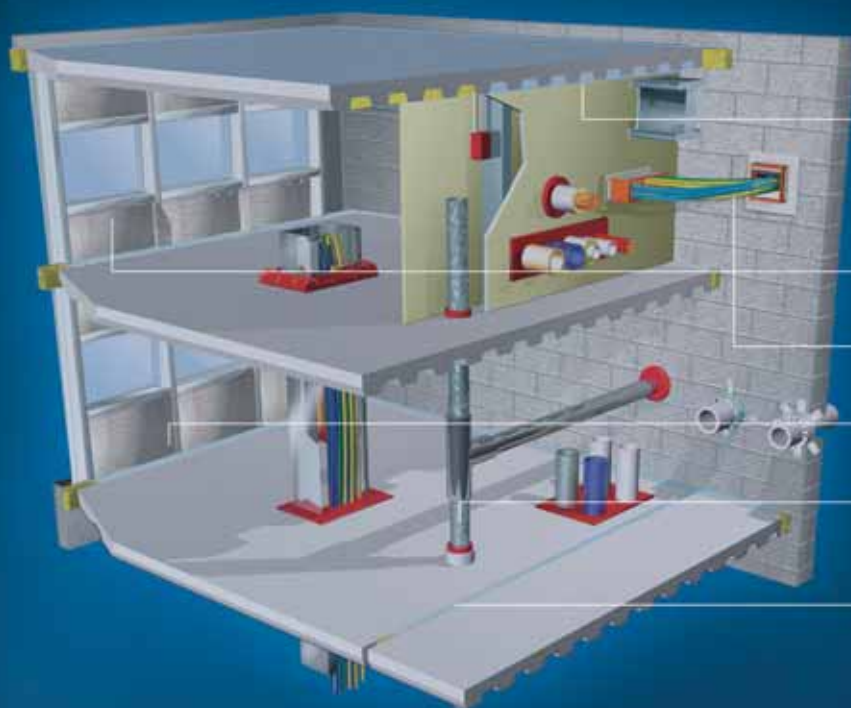
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# Firestopping & Effective Compartmentation

## Design, Installation, Inspection & Maintenance – Now and in the Future

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FCIA Photo



**Bill McHugh**

Firestop Contractors  
International  
Association

Fire resistance rated construction in buildings contains many components. Fire resistance rated walls and floors start the big box that creates effective compartmentation. The features of fire and smoke protection that provide continuity to the fire rated wall and floor assemblies include installed firestop systems, fire and smoke dampers, fire rated glazing and both rolling and swinging doors and hardware. These tested and listed systems provide fire resistance continuity and smoke resistant properties as well.

**T**he effective compartmentation industry has been working to improve on the installed product reliability from many perspectives. Each industry has been working to build better systems, focusing on the proper design, installation, inspection, maintenance and management (DIIM) of each effective compartmentation continuity component. This is the future of firestopping and effective compartmentation.

The first component is the "D-Design", where tested and listed systems are designed by manufacturers that submit products for testing at laboratories such as Underwriters Laboratories, LLC, (UL) and Underwriters Laboratories of Canada

(ULC), FM Approvals (FM), Intertek and others. The tested and listed systems provide the "suitability for use statements" for the fire resistance and smoke resistant products that become systems when used in specific applications. Testing continues to provide more competitive and better systems, designed by manufacturers of all types of effective compartmentation products.

### **Effective Compartmentation: The Rest of the Story – The 'IIM' in 'DIIM'**

The big differences are in the rest of the story. Testing provides suitability for use of products in specific applications. However, how do the



# ective n

products get handled once they leave the factory or manufacturer/distributors warehouse? That is where the rest of the story starts . . . the 'IIM' of the DIIM. 'IIM' means the installation, inspection, and maintenance of these fire resistance rated and smoke resistant barriers and their fire and smoke protection features.

Study of the effective compartmentation industries found the following activities to address the 'IIM' part of 'DIIM' by the firestopping, fire and smoke damper, fire rated glazing, rolling fire door and swinging fire doors and hardware industries:

## Firestop Systems

In North American and the Middle East, Caribbean and South America, this industry has focused on the "I-Installation" part of 'IIM' of firestopping through a focus on the company and the workforce. Third-party contractor company management system audits by laboratories like FM Approvals and UL, plus firestop/containment worker apprenticeship education for the workforce builds quality and reliability of the installed systems. Focusing on firestopping as a trade means that the systems are understood by management and the workforce; critical items for success.

The Firestop Contractors International Association (FCIA) collaborated with FM Approvals to build FM 4991, Standard for the Approval of Firestop Contractors, and with UL developing the UL/ULC Qualified Firestop Contractor Program. Both the FM 4991 and UL Qualified Firestop Contractor Programs provide general contractors, building owners and managers, fire marshals and building code officials a way to quantifiably qualify contractor companies. The FM 4991 and UL Qualified Firestop Contractor Programs differentiate installing contractors who have invested in their company's understanding of the zero tolerance quality installation process for firestopping.

FM 4991 or UL/ULC Qualified Firestop Contractors become approved or qualified after a company and on site audit takes place of their management system. A person who has passed a rigorous FM or UL/ULC firestop industry exam based on FCIA's Firestop Manual of Practice and firestop systems selection and analysis is named the 'Designated Responsible Individual', DRI. They become a DRI only after the firm becomes FM 4991 Approved or UL/ULC Qualified. Education for those taking the FM or UL/ULC firestop exam is offered at FCIA conferences, symposiums and more. For the workforce, look for an announcement in the fall about FCIA's new firestop containment worker program.

For the second 'I', Inspection, the 2012 International Building Code has a requirement for third-party, independent, special inspection of firestop installations using ASTM E 2174 and ASTM E 2393 Standards for the inspection of installed penetration (2174) and fire resistive joint (2393) firestops as the process.



*Identification label refers to the tested and listed system number for both inspection and maintenance/management purposes.  
FCIA Photo*

Firestop special inspections are required for structures 23 metres and higher above fire department access and critical occupancies found in IBC's table 1604.5. Buildings such as education, assembly and other occupancies may be subject to these inspections from the 1604.5 reference. FCIA was the code proponent that petitioned to include ASTM E 2174 & ASTM E 2393 in Codes. FCIA collaborated with manufacturers and consultants in the industry to create the ASTM E 2174 & ASTM E 2393 Standards. Canada is the next stop for this as well.

There is also a program that qualifies the special inspection agency to perform these inspections. The International Accreditation Services, (iAS), a subsidiary of the International Code Council, (ICC) has an Accreditation Criteria, AC-291 for special inspection agencies. In iAS AC-291, there are requirements for accrediting those inspection companies that specialise in firestop special inspection. FCIA's Standards Committee worked with iAS to build the firestopping section of iAS AC-291. Spray fire resistive materials and also intumescent fire resistive materials used for fireproofing are also subject to special inspection and referenced in iAS AC-291.

For "M-Maintenance", firestopping is included in the fire resistance rated system maintenance section in the International Fire Code 703.1 and NFPA 101, plus in the National Fire Code of Canada. In the International Fire Code, there is a requirement for annual inspection by the building owner. Here is the 'Maintenance' passage:

## Section 703

### Fire-Resistance-Rated Construction.

**703.1 Maintenance.** *The required fire-resistance rating of fire-resistance-rated construction (including walls, firestops, shaft enclosures, partitions, smoke barriers, floors, fire-resistive coatings and sprayed fire-resistant materials applied to structural members and fire-resistant joint*



# FIRESTOPPING & COMPARTMENTATION

FCIA Photo



*systems) shall be maintained. Such elements shall be visually inspected by the owner annually and properly repaired, restored or replaced when damaged, altered, breached or penetrated. Where concealed, such elements shall not be required to be visually inspected by the owner unless the concealed space is accessible by the removal or movement of a panel, access door, ceiling tile or similar movable entry to the space. Openings made therein for the passage of pipes, electrical conduit, wires, ducts, air transfer openings and holes made for any reason shall be protected with approved methods capable of resisting the passage of smoke and fire. Openings through fire-resistance-rated assemblies shall be protected by self- or automatic-closing doors of approved construction meeting the fire protection requirements for the assembly.*

(Excerpted from the 2012 International Fire Code, copyright, the International Code Council)

## Firestopping as a System

Throughout North America and internationally, firestopping is a systems-oriented installation. The product alone does not get a rating. Products must be installed to the tested and listed system from a nationally recognised testing laboratory before they become a fire and life safety tested and listed Firestop system.

It takes a firestop specialty contractor to understand all the details involved to get this done correctly so it works. It also takes a firestop specialty contractor to understand how to supervise the workforce so they do not 'get creative' in the field and vary from the tested and listed systems. Then, a special inspection agency that focuses on

firestopping is needed to know if a tested and listed system is installed properly.

Once the tested and listed firestop system is installed and the building turned over to the building owner and/or manager, the tested and listed systems can be managed or maintained for the life of the building.

Sounds easy? Try it in real life! That is why the specialty firestop contractor can be a great service to the building owner and manager. After the building is constructed, new pipe and cables are placed to serve building occupants. These make holes in the walls and floors that need to be treated to keep the continuity in place for fire and smoke resistance. Specialty firestop contractors understand how to maintain continuity of fire resistance. They also know what needs to be done to keep the rest of the fire resistance and smoke resistant system effective including fire-rated doors and dampers in addition to restoring the continuity to the wall itself. Rely on the specialty firestop contractor. They understand more than just firestop systems.

## What about the rest of the Fire and Smoke Protection Features?

### ● Fire & Smoke Dampers

The fire and smoke damper industry seems to focus on maintenance/testing during the building life cycle for ongoing reliability. Through building and fire codes, fire and smoke damper inspections are required at building commissioning, then after the first year, and every four years thereafter in most occupancies.

Healthcare occupancies have dampers inspected every at commissioning, after the first year then

every six years thereafter. According to the health-care industry, this is due to the very high degree of maintenance and management that takes place in these structures, which results in greater reliability with less inspection. FCIA members also provide fire damper inspections to provide greater reliability of fire resistance rated and smoke resistant assemblies.

For installation, the National Energy Management Institute developed a program for contractors that are signatory to and use workers exclusively from the Sheet Metal Workers Union. Sheet metal contractors that install fire and smoke dampers and opt into this program have their management systems audited by the National Energy Management Institute.

Fire and Smoke dampers are also included in the fire resistance rated system visual inspection maintenance requirements in the International Fire Code 703.1 when they are not concealed. Many manufacturers provide education to those firms inspecting fire dampers.

#### ● Fire Rated Glazing

Research showed that there currently are no unique, organised 3rd party accreditation programs for installing companies. Inspection has been made more uniform through a new labelling format as specified by the 2012 International Building Code (IBC) in Chapter 7. More adjustments to this language may be part of the 2015 IBC as well. Fire-rated glazing is also included as a fire resistance rated construction maintenance item requiring visual inspection in the International Fire Code 703.1.

#### ● Rolling Fire Doors

Rolling fire doors are the largest opening in a fire resistance rated assembly. The Institute of Door Dealers education and accreditation programs provide a certification for rolling fire door installing workers. The individual certification, managed by the association, is a knowledge-based program where those with minimum two years' experience in the field and pass an industry examination become certified. NFPA 80 specifies drop testing frequencies for these assemblies. Maintenance is covered under the International Fire Code 703.1 for annual visual inspection by the building owner as well.

### Want to get involved?

The Firestop Contractors International Association has been involved in the development of better reliability of firestopping installations by building:

- Body of Knowledge – the FCIA Firestop Manual of Practice is the study guide for FM & UL firestop exams. It is also where the firestop industry knowledge rests.
- Build the reliability of firestopping – FCIA's committees worked with FM Approvals, UL, ASTM, IAS and at ICC, NFPA to build and implement the DIIM for firestopping. Join the association to get involved.
- Educate – at FCIA conferences, meet industry leaders in firestopping and effective compartmentation.



*This photo looks simple. It's not. Firestop systems listings will state the height of the sleeve, type of floor, pipe size and type, annular space max and minimums, location of firestop material in sleeve at top, or at plane of floor, type of sleeve and much more. Once the 'systems protocol' is understood, Firestopping is recognized as a specialty trade.*

#### ● Swinging Fire Doors and Hardware

Manufacturers provide installation instructions and there is available training for the workforce from organisations such as the carpenters and labourers' unions. The Door and Hardware Institute's Foundation for Door Safety and Security has built a very credible fire door assembly inspection education program to qualify individuals performing fire door inspections in existing buildings. Additionally, DHI's relationship with Intertek has produced an Intertek-certified Fire Door Inspector Professional Certification and a company certification as well. In the complete certification program, the inspection company is audited and company certification awarded as well.

The Foundations' efforts have been well received as ways to increase the reliability of installed swinging fire doors through the annual door inspection requirements that reside in NFPA 80 and also the International Fire Code, 703.1.

#### ● Walls and Floors

Inspections of fire and smoke resistant assemblies find that walls and floors may have large holes with no penetrating items such as pipes and cables. Those walls need to have their continuity restored through reconstruction of the wall to the tested and listed system design.

#### ● Structural Steel Fireproofing

This industry has seen several changes the past few years. At the International Code Council's past two code development cycles, increased bond strength and inspection frequencies have been added to the requirements for high rise buildings. UL has a qualified fireproofing contractors program similar to the firestopping industry. The National Fireproofing Contractors Association provides education to those seeking individual certification as well. The heart of this program is NFCA individual personnel examination on NFCA manuals and education. CEU's are required as part of the program. With a minimum two years' experience and member in good standing status at NFCA, the company is recognised as well through this Contractor Accreditation Program. **IFP**

**Bill McHugh** is Executive Director of the Firestop Contractors International Association

For further information, go to [www.FCIA.org](http://www.FCIA.org)

FyreWrap® DPS Insulation just opened the door to improved dryer duct fire protection.



Recent NFPA statistics indicate significant injuries, loss of life and property damage due to clothes dryer fires in residential buildings. At the same time, code requirements for dryer exhaust ductwork in multi-family residences have been difficult to achieve in real-world conditions – until now.

### Introducing new FyreWrap® DPS Insulation for dryer ducts and plenums.

FyreWrap® DPS Insulation is an innovative duct wrap that provides a safe and cost-effective means to achieve a 1-hour fire resistance-rated enclosure for routing dryer ductwork through rated wood construction. It utilizes a lightweight, high temperature, low bio persistence fiber blanket specifically designed, UL tested and classified for this

critical application. It also provides code compliant fire protection for combustible items such as plastic pipes in the plenum area. FyreWrap DPS Insulation features a ½", single layer design that is flexible and easy to cut, fabricate and wrap to fit tight spaces, providing time- and cost-savings on many projects.



More information on FyreWrap DPS and our complete line of FyreWrap products is available at [www.arcat.com](http://www.arcat.com) and [www.unifrax.com](http://www.unifrax.com) or by calling 716-768-6500.

**UNIFRAX**  
[www.unifrax.com](http://www.unifrax.com)





*Traditional protection may be in the form of non-combustible boards, mineral fibre casings, cementitious or vermiculite sprays.*



# Guide to Steel Fire Protection

The Association for Specialist Fire Protection has published a new edition of its 'Yellow Book' guide to fire protection for structural steel in buildings.



**Niall Rowan**

The Association for Specialist Fire Protection

**F**ire protection to structural steelwork plays an essential role in ensuring that buildings will not collapse prematurely in the event of a fire, providing time for the occupants to escape and for the fire service to obtain access and fight the fire.

You might ask why steel needs protecting at all? After all, it is non-combustible and does not melt until around 1,500°C, a temperature almost never experienced in fire. However, at a temperature of between 500°C and 600°C, mild steel loses approximately half its strength. Since fires in buildings regularly exceed 1,000°C within a relatively short period of time, fire protection is needed to limit the temperature rise in the steel so that sufficient strength will remain in the structural frame.

In some cases no protection is needed, for example if the fire resistance period is low, for example 30 minutes, and/or if a whole frame structural analysis is undertaken and the interaction between various elements of the frame means that some elements do not need to retain the strength they have in the cold state. However, in most steel framed buildings, protection will be required to some or all of the elements.

Traditionally, fire protection, in the form of non-combustible boards, cementitious/vermiculite sprays or mineral fibre casings is applied to insulate the frame. These materials have the advantages of being robust and tolerant of poor site conditions and abuse. However, increasingly, intumescent or reactive materials (paints) are being used. These are quicker and easier to apply and have good aesthetic properties, but care is needed when applied on site to avoid problems later on in the lifetime of the building. The Association for Specialist Fire Protection (ASFP) has published a number of codes of practice for the application of structural fire protection products.

To aid the evaluation of proprietary fire protection of structural steelwork to comply with Building Regulations for England and Wales, the ASFP has released the fifth edition of its Yellow Book, *Fire Protection for Structural Steel in Buildings*.

The Yellow Book, which was originally published 30 years ago, has become the definitive reference to the provision of fire protection to structural steel in buildings, and is referenced in Approved Document B to the Building Regulations in England and Wales. It provides a source of

*Cellular beams protected by intumescent coating.*



validated performance data about such products provided by ASFP members. It also provides a comprehensive guide to proprietary materials and systems, all of which are manufactured, marketed or site applied by ASFP members.

## Significant Changes

The fifth edition of the ASFP Yellow Book incorporates a significant number of important changes. It has been completely restructured to take into account major developments in the standardisation of the testing and assessment of products that protect structural steel members. These include:

- The publication of European standards for the evaluation of passive materials, reactive materials and the evaluation of fire protection of cellular beams.
- Reference to a default structural model, commissioned by the ASFP, to predict limiting temperatures for cellular beams with openings of various shapes, which can then be used to generate appropriate thicknesses of fire protection.
- Significant revisions to the sections on structural fire engineering to take into account the advance of the structural Eurocodes and the resultant changes to default critical temperatures.

The new Yellow Book is designed to help all those involved in the design, procurement, specification and manufacture of structural steel in buildings. It is arranged in six sections:

### • Section One

Deals with general aspects of passive fire protection to steel; the reduction of strength with temperature, fire protection techniques (profiled, boxed or solid), general principles of the fire tests undertaken (full size loaded beam and column tests, supplemented with data obtained from short sections) and an introduction to the concept of limiting temperatures.

Sections two and three introduce two routes for the evaluation of proprietary fire protection.

### • Section Two

A traditional Yellow Book assessment that is based on fire tests on fully loaded sections and thermal data derived from testing to BS 476 or EN 13381 methods. This will most likely be used in the UK while CE marking is still not mandatory for fire protection products for structural steel and in areas of the world where British Standards are still used.

Section 2 is split into reactive products (intumescent) and non-reactive products (boards, sprays and renders). For each product group there are comprehensive details of the test programme (beams/columns and short sections to be tested) and the assessment methodology to be used. For reactive products, the graphical approach is used for the assessment and for non-reactive products a numerical regression analysis is employed.

### • Section Three

An assessment of EN 13381-4 (non-reactive products) or EN 13381-8 (reactive products), which can only be based on thermal data derived from testing to European (EN) test methods. This can also be used in the UK and in continental Europe where CE marking against a European Technical Assessment (ETA) will be the route to market. Increasingly, manufacturers will use this route as they use European test standards to avoid duplication of testing to both British and European standards.

Assessment methods that can be used under the EN include: graphical, differential equation (2No) and numerical regression analysis. There is less detail in this section because the test and assessment methodologies are detailed in the relevant European standard. However, there is a significant amount of guidance material including how the test and assessment methodologies vary from the British approach in section two.

### • Section Four

Considers the fire protection of beams with web openings (cellular beams) that are increasingly



being used to accommodate services such as cables, pipes and ducts. The inclusion of web openings means the structural capability differs from that of a solid beam in that the failure mode in fire is related to the closeness of holes and the web slenderness in addition to section factor. Structural failure can be through, for example, Vierendeel bending above the opening or buckling of the web post. Such failure modes generally occur at lower temperatures than a plain beam of the same size and, consequently, it is necessary for cellular beams to be structurally evaluated taking into account all possible modes of structural failure.

Additional thermal data measured around the web openings and on the web posts is used in conjunction with a structural model to determine the beam's limiting temperature under the applied load. To provide a consistent approach, the ASFP sponsored the Steel Construction Institute (SCI) to produce a model (RT 1356) capable of considering a wide range of beam designs and opening shapes and spacing. Other models may also be used but RT 1356 is the default model for the Yellow Book.

Section Four also contains a detailed test and assessment protocol for reactive products following EN 13381 Part 9. Non-reactive products can be evaluated in the same way as reactive products, or may make use of the existing '20 percent rule', whereby the thickness used for cellular beams is increased by 20 percent over that used on a plain beam. To ascertain if the 20 percent thickness modification factor is conservative and appropriate, a new short test protocol has been included.

#### ● Section Five

Provides an introduction to the Construction Products Regulation, CE marking and European Technical Assessments (ETAs) for passive fire protection products used to protect structural steel. It explains the current status of CE marking for these products, which depends on whether the products are covered by a European Product Standard or a European Technical Approval. These two types of document may sound the same, but the implications are very different with each type.

If a product standard has been published, then CE marking is mandatory; if the product is covered by a European Technical Approval then it is not. Currently a product standard is being developed for reactive products and there are also moves afoot to 'convert' the European Technical Approval Guidelines covering non-reactive products into product standards. All this will eventually lead to mandatory CE marking, although this is some years away.

#### ● Section Six

Explains how material data sheets will be presented for those manufacturers wishing to list their products in the Yellow Book. All products listed in the Yellow Book must be either CE marked under the Construction Products Regulation, or hold third-party certification from a certification body under a scheme accredited to EN 45011 (to become ISO 17065) and carried out by a UKAS-accredited (or nationally equivalent) certification body.

Current entries issued under edition four of the Yellow Book will be carried over into the 5th



*Fire protection is needed to limit the temperature rise in the steel*

edition. However, new products and old products as their certification comes up for review (normally five years) will be included in the book only if they have been evaluated against the relevant part of the 5th edition.

### Appendices

The new Yellow Book also contains a number of detailed appendices that contain much of the useful guidance material from the 4th edition, suitably updated for the 5th edition.

**Appendix One:** contains guidance of the British and European test and assessment methods.

**Appendix Two:** contains detailed guidance on section factors for plain, cellular and castellated beams, structural hollow sections, partially exposed members, tapered sections, lattice members and light gauge rolled steel sections.

**Appendix Three:** has extensively revised the engineered approach to structural fire protection to take into account the increasing use of the Structural Eurocodes. A new section on default limiting and critical temperatures has been included that provides a range of critical temperatures derived from the Eurocodes, taking into account load factors in different building types. Another set of default critical temperatures is provided if the building type is not known. In addition to the Eurocode approach, default limiting temperatures from BS 5950 Part 8 are also included. Appendix 3 also contains extensively revised guidance on deck voids above composite and non-composite beams.

The new Yellow Book is technically the most advanced and authoritative the ASFP has ever produced, having been revised over a period of two years and via many meetings of the ASFP's Task Group 1 (reactive products), Task Group 2 (non-reactive products) and the ASFP Technical Committee. It will be an invaluable source of information for all those professionals working with steel that requires fire protection. The new 5th edition of the Yellow book is free to download from the ASFP website at [http://asfp.associationhouse.org.uk/default.php?cmd=210&doc\\_category=119](http://asfp.associationhouse.org.uk/default.php?cmd=210&doc_category=119). **IFP**

**Niall Rowan** is Technical Officer at the Association for Specialist Fire Protection

For further information, go to [www.asfp.org.uk](http://www.asfp.org.uk)



# Fire-Rated Glass in



**Steve Bond**

Pilkington



As architectural design values have evolved, glass has remained one of the most ubiquitous construction materials. What has not changed, however, is that a building has a fundamental duty to protect the people and possessions within it.

**T**he recent fire at Glasgow School of Art's Mackintosh building in Scotland has highlighted the challenges in not only protecting individuals, but avoiding potential damage and expensive repair costs, which in this case is estimated to be in excess of £20 million.

In the event of a fire, specialist glazing solutions can play a pivotal role in protecting individuals by preventing the spread of smoke and flames. While fire-resistant glazing has become a crucial component of modern design and construction, retrofitting these systems in older properties has sometimes been perceived as troublesome, given the need to preserve a building's character.

### **What is Fire-Resistant Glazing?**

Fire-resistant glass can not only help protect the integrity of a structure, buying those inside it vital time in which to exit the building, it can also help preserve valuable contents, like company records, artwork or historical artefacts.

One of the reasons that fire-resistant glass is used more frequently in contemporary building construction is because of its ability to combine safety and protection properties with appealing aesthetics and the performance features of modern glazing, such as low-emissivity, noise reduction, solar control or safety ratings; all of which provide solutions to key demands in today's market.

Irrespective of the age of the building, using fire-resistant glazing can allow for these benefits to be incorporated into the existing building, and also offer the required level of fire protection.

### **The Advent of Fire Safety**

There remains a key focus and attention on fire safety since the UK's Regulatory Reform (Fire Safety) Order 2005. Since then, building owners and operators are responsible for ensuring that appropriate fire precautions and protection measures are in place. Building regulations also place responsibility on those who carry out the work.

As well as holding building owners to account for the welfare of occupants, the Reform has helped to instil best practice at each stage of the design and construction process. This applies to risk assessors, building engineers, suppliers, installers and, of course, manufacturers, all of whom must play their part by producing and specifying the safest solution for the installation.

### **Why Specify Fire-Resistant Glazing?**

The key function of fire-resistant glazing is to allow the safe escape of building occupants, while allowing unhindered access for rescue crews. Fire-resistant glazing physically separates people and valuable objects from flames, smoke, heat and other products of combustion, which is critical for safe egress.

While providing a level of protection, fire-resistant glazing can be more aesthetically pleasing than traditional solid walls because of the advantages of transparency provided by glass as it allows light into the body of the building.

Containing the fire as much as possible can help limit damage to the building as well as any adjoining structures, which can reduce need for remedial works. Needless to say, rebuilding and

# Heritage Buildings

refurbishing a building with fire damage is a time-consuming and expensive task. If a fire is not contained, it can cause the integrity of the structure to be compromised, resulting in partial or complete collapse. This can have costly, and more importantly, fatal consequences.

## Integrity & Insulation

One of the most fundamental, and yet often-overlooked, aspects of installing fire-resistant glass is that it must be used as part of a fully qualified fire-rated system. All parts of the unit – including the glass, the glazing seal, beading, fixings and the frame itself – must be compatible under fire conditions, and its performance must be referenced to appropriate and relevant test evidence.

Fire-resistance performance is defined by two categories:

- The first is the level of integrity that the glass can provide; this is measured by a function of time. The tested system must contain the fire and also protect from sustained flaming on the non-fire side. Products are subjected to a standard time/temperature curve according to either British Standard BS 476-Part 20-22 or European standard EN1363 series. Depending on performance in these tests, the products are classified to the attained test time 30, 60, 90, 120 and even 180 minutes.
- The second category is insulation; this assesses the glass' ability to prevent significant heat transfer from the flames on to the non-fire side, with the non-fire side face not exceeding an average temperature of 160°C. This type of performance is beneficial for use in stairwells and access corridors, for example, as these need to be kept as cool as possible in order to create a safe access and exit route for occupants and firefighters.

Our understanding of glass' behaviour in fire, as well as advances in glass technology, has led to



the development of some innovative fire-resistant glazing solutions. Unlike fire-rated glass products of the past, such as wired-glass, modern products are completely transparent and therefore more aesthetically appealing.

Some maintain this transparent appearance during a fire, while others use intumescent inter-layer technology to create an opaque insulating barrier for added protection. This is particularly effective because it reacts with the flames and heat and turns the glass white. The benefit of this is two-fold: firefighters are better able to determine the location of the fire quickly and efficiently, and the insulating properties of the glass means that the space on the other side of fire is cool enough to use as an easy and safe means of escape by possibly disorientated occupants. There is also the additional potential benefit of reducing panic during evacuation by masking the true extent of the fire.

## Case Study: The Swiss Church

In 2009, The Swiss Church Grade II listed building underwent a £2 million renovation and modernisation. A key part of the brief was to maintain the original character of the property.

The beautiful structure, built in 1775 in the heart of London's Covent Garden, illustrates how fire-resistant glazing can be incorporated into an important historical building, improving performance without dramatically altering its appearance. The refurbishment included repairs to the façade, internal modifications and new windows. Fire-rated glazing was specified for all the glass replaced during the project in order to provide greater levels of fire protection.

The fire-rated system installed provides 30-minute integrity and insulation in case of fire. The glass also provided an unobtrusive way of extending the focal point of the building, the central hall.

## Fire-Rated Glazing in Heritage Settings

While the benefits of fire-resistant glass solutions have long been appreciated in new-build settings, there is now a growing recognition of the need to install such products in existing, heritage and historical buildings.

Here lies the challenge of bringing these buildings in line with the latest fire safety practices without compromising their essential character, aesthetics and functionality. The use of fire-resistant glass in such properties enables the preservation and protection of the old, while gaining the benefit of modern fire-resistant technology. This is all possible while enhancing the security of the building, and improving its energy performance and carbon footprint.

Contractors and installers can run into difficulties when retrofitting older buildings because



there are some who are opposed to the installation of new materials not true to the era or architectural style of the original structure. However, the benefits of doing so can make the difference between a building being damaged beyond repair and a fire being contained effectively. This can prevent Listed or Graded buildings being lost forever, and affords owners the opportunity to save and restore them to their former glory.

Where modern buildings benefit from the added protection of devices such as water sprinkler systems, it can be challenging and disruptive to install these into centuries-old structures. Fitting unobtrusive, transparent fire-resistant glass in internal partitions and door panels offers a simple and effective solution to balancing character integrity with fire safety.

### Case Study: Bedford Magistrates' Court House

Fire-rated glazing was specified and installed in the Grade II listed Magistrates' Court building in Bedford, as part of a £1.2 million refurbishment programme. The gothic building, constructed in the 1800s, now has fire-resistant glazing in doors, screens and windows, offering both fire integrity and insulation, as well as enhancing the building's appearance.

As a public building used by hundreds of people every week, it was essential that the highest level of fire protection was installed. A specialist fire-resistant glazing system, which turns opaque when in contact with fire, was used. Such glass provides protection against heat, flames and hot gases for up to 180 minutes, which allows for enough time to evacuate the building.

### Key Advice

Here is some key advice when specifying fire-resistant glass in order to achieve maximum protection and performance:

- Specifiers, architects, contractors and installers must work together to confirm the level and type of fire resistance required – some systems offer integrity only, others both integrity and insulation.
- When installing fire-resistant glazing in large buildings with lots of visitors, such as museums, the recommendations within building regulations and risk assessments should be followed.
- Remember that the unit in its entirety must be a qualified fire-rated system, and that the system profile is the correct size and specification for the building. Naturally, manufacturers are on-hand to support customers through the specification and installation process. Cutting corners, or simply not understanding the range of glazing systems available in today's market, risks compromising the entire building and can lead to potentially fatal consequences.

### Product Innovation

As our understanding increases of how glass behaves in fires, and modern glazing technology advances, so too does the appreciation of fire-rated glass' benefits among contractors and installers. As a result, retrofitting such solutions in heritage buildings continues to become more popular.

Product innovation, driven by ongoing commitment to research and development programmes, will help to further enhance the performance of fire-resistant glass to the benefit of the entire glazing market. Not only will this allow for even greater levels of protection for people and property, but for more challenging refurbishment projects to be successfully completed in the future. **IFP**



*Fire resistant glazing in the central hall of the Swiss Church.*

**Steve Bond** is Customer Support Manager – Fire Products at Pilkington United Kingdom

For further information, go to [www.pilkington.com](http://www.pilkington.com)



When fire breaks out, you need a glass that keeps its cool.



### Pilkington **Pyrostop**® and Pilkington **Pyrodur**®

In the event of fire, Pilkington **Pyrostop**® can provide insulation against heat for up to 180 minutes, in appropriate frames; with Pilkington **Pyrodur**® also able to provide full insulation for a short period of time – protecting the property and giving people more than enough time to vacate the building safely. As well as acting as a barrier against hot gases and flames to increase protection, they reduce any panic by turning opaque. Available in a range of thicknesses to suit every need, Pilkington **Pyrostop**® and Pilkington **Pyrodur**® can definitely stand the heat.

For more information on all the products in our fire-resistant range, including our new advanced toughened glass Pilkington **Pyroclear**®, visit [www.pilkington.co.uk/fireresistant](http://www.pilkington.co.uk/fireresistant), email [pilkington@respond.uk.com](mailto:pilkington@respond.uk.com), call 01744 692000 quoting 18842 or contact one of our stockists.

#### Stockists

<b>Anders Glass Ltd - Manchester</b> 0161 736 2487	<b>Diamond Glass - Dublin</b> +353 1620 5000	<b>Excel Glass Ltd - Belfast</b> 02890 382121	<b>Nicholls &amp; Clarke Glass - London</b> 0207 5400 310	<b>Pilkington Basingstoke</b> 01256 469651	<b>Pilkington Plyglass</b> 01773 520 000	<b>Independent Glass - Glasgow</b> 0141 613 1599	<b>Exeter Glass Centre - South West</b> 01392 364 364
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FROM INDIVIDUAL PUMPS  
TO TOTAL SYSTEMS,  
WE HAVE IT ALL.

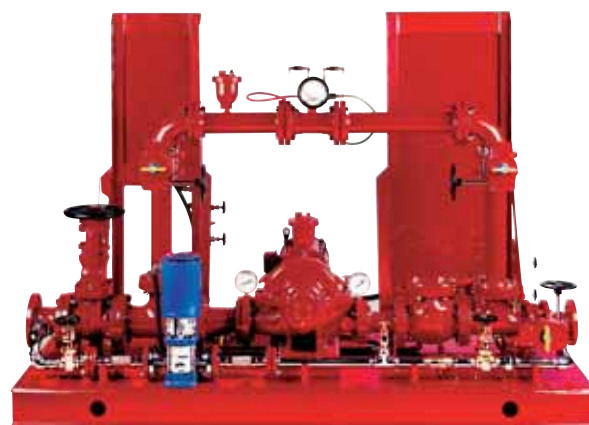
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# Fire performance o



**Richard Hosier**

Electrical cables are frequently blamed by the media and fire authorities as the cause of building fires however it is often not the failure of the cable which starts a fire but the misuse of the cable by frayed or damaged insulation, overloading due to incorrect or insufficient circuit protection, short circuit or over voltage. These situations can cause high temperatures in the cable conductors or electrical arcing which may heat the cable insulation and any surrounding combustible materials to start a fire.

**C**able manufacturers generally endeavour to manufacture electric cables which under the above situations, or in cases where a fire is started by another unrelated cause, will not burn or at least will not help spread a fire through the building.

Today there are various cable flame retardance test standards written by technical standards committees in Europe and USA. These common standards propose test methods intended to determine if the electric cables or materials they are made from are self-extinguishing (Flame Retardant). These test methods may also be embedded by Authorities into mandatory building design codes.

This article takes a look at the common test methods and questions if the test protocols employed do in fact provide the implied level of flame retardance performance when cables are installed and used in buildings.

## **Making flexible electric cables**

Most common flexible cables are made from hydrocarbon based polymers. These base polymers are not usually flame retardant and have a high calorific

value so chemicals are added to make them more suited to electrical cable use. Halogens like Chlorine are particularly good additives which help retard flame propagation and don't significantly impact the dielectric properties of the polymer so Halogens can be used in both cable insulations and in cable sheaths. These halogenated polymers (example: PVC & CSP) also have a negative side effect that in fire they can release the halogens which are extremely toxic and when combined with the moisture in eyes, mouth and lungs are very irritant.

For cables which need to be 'Halogen Free' and 'Flame Retardant' other non-halogen flame retarding elements like alumina-trihydrate (ATH) can be used instead of Halogens, but while effective in retarding flame propagation these fillers often negatively affect the polymer by reducing dielectric performance or affecting mechanical and water resistance. For this reason additives like ATH are mostly used only in cable jackets. Halogen Free Flame Retardant cables most often use a more pure polymer like PE, XLPE or EPR for the insulation which has good dielectric and mechanical properties but may not be very flame retardant.

# f Electric Cables

## Electric Cables: Propagation performance in fire

Often the best flame retardant cables are halogenated because both the insulation and outer jacket are flame retardant but when we need Halogen Free cables we find it is often only the outer jacket which is flame retardant and the inner insulation is not.

This has significance because while cables with a flame retardant outer jacket will often pass flame retardance tests with external flame, the same cables when subjected to high overload or prolonged short circuits have proved in university tests to be highly flammable and can even start a fire. This effect is known and published (8th International Conference on Insulated Power Cables (Jicable'11 – June 2011) held in Versailles, France) so it is perhaps surprising that there are no common test protocols for this seemingly common event and one cited by both authorities and media as cause of building fires.

Further, in Flame Retardant test methods such as IEC60332 parts 1 & 3 which employ an external flame source, the cable samples are not pre-conditioned to normal operating temperature but tested at room temperature. This oversight is important especially for power circuits because the temperature index of the cable (the temperature at which the cable material will self-support combustion in normal air) will be significantly affected by its starting temperature i.e.: The hotter the cable is, the more easily it will propagate fire.

It would seem that a need exists to re-evaluate current cable flame retardance test methods as these are commonly understood by consultants and consumers alike to provide a reliable indication of a cables ability to retard the propagation of fire.

## If we can't trust the Standards what do we do?

In the USA many building standards do not require halogen free cables. Certainly this is not because Americans are not wisely informed of the dangers; rather the approach taken is that: "It is better to have highly flame retardant cables which do not propagate fire than minimally flame retardant cables which may spread a fire" – (a small fire with some halogen may be better than a large fire without halogens). One of the best ways to make a cable insulation and cable jacket highly flame retardant is by using halogens.

Europe and many countries around the world adopt a different mentality: Halogen Free and Flame Retardant. Whilst this is an admirable mandate the reality is rather different: Flame propagation tests for cables as adopted in UK and Europe can arguably be said to be less stringent than some of the flame propagation tests for cables in USA leading to the conclusion that common tests in UK and Europe may simply be tests the cables can pass rather than tests the cables should pass.

## Conclusion

For most flexible polymeric cables the choice remains today between high flame propagation performance with halogens or reduced flame



propagation performance without halogens.

Enclosing cables in steel conduit will reduce propagation at the point of fire but hydrocarbon based combustion gasses from decomposing polymers are likely to propagate through the conduits to switchboards, distribution boards and junction boxes in other parts of the building. Any spark such as the opening or closing of circuit breakers, or contactors is likely to ignite the combustible gasses leading to explosion and spreading the fire to another location.

While MICC (Mineral Insulated Metal Sheathed) cables would provide a solution, there is often no single perfect answer for every installation so designers need to evaluate the required performance on a "project-by-project" basis to decide which technology is optimal.

## The primary importance of fire load

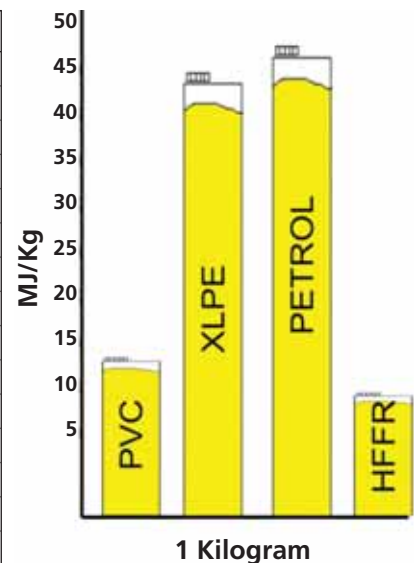
Inside all buildings and projects electric cables provide the connectivity which keeps lights on, air-conditioning working and the lifts running. It powers computers, office equipment and provides



Table 1

Common Name	Description	MJ/Kg
<b>Petrol</b>		<b>48</b>
XLPE	Polyethylene	46
PP	Polypropylene	46
Nylon 66	Polyamide	33
EPR	Ethylene propylene rubber	28.5
CSP	Chlorosulphonated polyethylene	28
<b>Coal</b>		<b>25</b>
PCP	Polychloroprene rubber	24
<b>Wood</b>		<b>18.5</b>
PVC	Polyvinyl chloride	18
SIR	Silicone Rubber	15.5
ETFE	Ethylene tetrafluoroethylene	13.8
HFFR	Halogen Free Flame Retardant	13
PTFE	Polytetrafluoroethylene	5
MICC	Bare Mineral Insulated Metal Sheathed	0

Table 2



the connection for our telephone and computers. Even our mobile phones need to connect with wireless or GSM antennas which are connected to the telecom network by fiber optic or copper cables. Cables ensure our safety by connecting fire alarms, emergency voice communication, CCTV, smoke shutters, air pressurization fans, emergency lighting, fire sprinkler pumps, smoke and heat detectors, and so many other features of a modern Building Management System.

Where public safety is important we often request cables to have added safety features such as flame retardance to ensure the cables do not easily spread fire, circuit integrity during fire so that essential fire-fighting and life safety equipment keep working. Sometimes we may recognize that the combustion of electric cables produces smoke and this can be toxic so we call for cables to be Low Smoke and Halogen Free. Logically and intuitively we think that by requesting these special properties the cables we buy and install will be safer.

Because cables are installed by many different trades for different applications and are mostly hidden or embedded in our constructions, what is often not realized is that the many miles of cables and tons of plastic polymers which make up the cables can represent one of the biggest fire loads in the building. This point is certainly worth thinking more about.

PVC, XLPE, EPR, CSP, LSOH (Low Smoke Zero Halogen) and even HFFR (Halogen Free Flame Retardant) cable materials are mostly based on hydrocarbon polymers. These base materials are not generally flame retardant and naturally have a high fire load. Cable manufacturers make them flame retardant by adding compounds and chemicals. Certainly this improves the volatility of burning but the fuel content of the base polymers remains.

Tables 1 and 2 above compare the fire load in MJ/Kg for common cable insulating materials against some common fuels. The Heat Release Rate and volatility in air for these materials will differ but the fuel added to a fire per kilogram and the consequential volume of heat generated and oxygen consumed is relative.

The volume in kilometers and tons of cables installed in our buildings and the associated fire load of the insulations is considerable. This is particularly important in projects with long egress times like high rise, public buildings, tunnels and underground environments, airports, hospitals etc.

When considering fire safety we must first understand the most important factors. Fire experts tell us most fire related deaths in buildings are caused by smoke inhalation, temperature rise and oxygen depletion or by trauma caused by jumping in trying to escape these effects.

## Smoke

The first and most important aspect of smoke is how much smoke? Typically the larger the fire the more smoke is generated so anything we can do to reduce the spread of fire will also correspondingly reduce the amount of smoke.

Smoke will contain particulates of carbon, ash and other solids, liquids and gasses, many are toxic and combustible. In particular, fires in confined areas like buildings, tunnels and underground environments cause oxygen levels to drop, this contributes to incomplete burning and smoldering which produces increased amounts of smoke and toxic byproducts including CO and CO<sub>2</sub>. Presence of halogenated materials will release Halides like Hydrogen Chloride together with many other toxic and flammable gasses in the smoke.

For this reason common smoke tests conducted on cable insulation materials in large 3 meter<sup>3</sup> chambers with plenty of air can provide misleading smoke figures because complete burning will often release significantly less smoke than partial incomplete burning which is likely in practice. Simply specifying IEC 61034 with a defined obscuration value then thinking this will provide a low smoke environment during fire may unfortunately be little of help for the people actually involved.

## Halogens, Toxicity, Fuel Element, Oxygen Depletion and Temperature Rise

It is concerning that Europe and other countries adopt the concept of halogen free materials without properly addressing the subject of toxicity.

Halogens released during combustion are extremely toxic but so too is carbon monoxide and this is not a halogen gas. It is common to call for halogen free cables and then allow the use of Polyethylene because it is halogen free. Burning Polyethylene (which can be seen from the table above has the highest MJ fuel load per Kg of all insulations) will generate almost 3 times more heat than an equivalent PVC cable. This means is that burning polyethylene will not only generate almost 3 times more heat but also consume almost 3 times more oxygen and produce significantly more carbon monoxide. Given carbon monoxide is responsible for most toxicity deaths in fires this situation is at best alarming!

The fuel elements shown in the table above indicate the amount of heat which will be generated by burning 1kg of the common cable insulations tabled. Certainly this heat will accelerate the burning of other adjacent materials and may help spread the fire in a building but importantly, in order to generate the heat energy, oxygen needs to be consumed. The higher the heat of combustion the more oxygen is needed, so by choosing insulations with high fuel elements is adding significantly to at least four of the primary dangers of fires: Temperature Rise, Oxygen Depletion, Flame Spread and Carbon Monoxide Release.

Perhaps it is best to install polymeric cables inside metal conduits. This will certainly help flame spread and minimize smoke because inside the conduit oxygen is limited; however this is not a solution. As said previously, many of the gasses from the decomposing polymeric insulations inside the conduits are highly flammable and toxic. These gases will migrate along the conduits to junction boxes, switch panels, distribution boards, motor control centers, lamps, switches, etc. On entering the gases can ignite or explode with any arcing such as the make/break of a circuit breaker, contactor, switch or relay causing the fire to spread to another location.

### Conclusion

The popularity of "Halogen Free" while ignoring the other toxic elements of fire is a clear admission we do not understand the subject well nor can we easily define the dangers of combined toxic elements or human physiological response to

them. It is important however, that we do not continue to design with only half an understanding of the problem. While no perfect solution exists for organic based cables, we can certainly minimize these critically important effects of fire risk:

One option maybe to choose cable insulations and jacket materials which are halogen free and have a low fuel element, then install them in steel conduit or maybe the American approach is better: to use highly halogenated insulations so that in case of fire any flame spread is minimized.

For most power, control, communication and data circuits there is one complete solution available for all the issues raised in this paper. It is a solution which has been used reliably for over 80 years. MICC cables can provide a total and complete answer to all the problems associated with the fire safety of organic polymer cables.

The copper jacket, magnesium oxide insulation and copper conductors of MICC ensure the cable is effectively fire proof. MICC cables have no organic content so simply cannot propagate flame or generate any smoke. The zero fuel load ensures no heat is added and no oxygen is consumed.

Being inorganic MICC cables cannot generate any halogen or toxic gasses at all including CO.

Unfortunately many common cable fire test methods used today may inadvertently mislead people into believing the polymeric flexible cable products they buy and use will perform as expected in all fire situations. As outlined in this paper, sadly this may not be correct.

**Richard Hosier** is Sales Director in Singapore and Malaysia for the TRM & MICC Group, based in Singapore. He has been working in the electrical cable industry for thirty years specialising in the fire performance of cables. He has lectured at institutions, universities and has published several technical papers as well as serving on three Australian and New Zealand technical standards committees for cables and fire performance wiring systems.

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# Opening the Door

Testing must be conducted by a Notified Body, such as BM TRADA.



**Peter Barker**

BM TRADA



This article provides an introduction into CE marking of pedestrian doorsets with fire and/or smoke control characteristics. It also reviews some of the frequently asked questions received from manufacturers who have achieved third-party certification via the BM TRADA Q-Mark Fire Door Manufacture scheme and from members of the Architectural Specialist Door Manufacturers Association (ASDMA).

**T**he Construction Products Regulation (CPR) introduced the most significant regulatory change for a decade in the way that construction products are manufactured and sold in the European Union (EU). The CPR replaced the Construction Products Directive (CPD) and made CE marking mandatory across the entire European Union (EU), for products defined by relevant harmonised European Product Standards (hEN). The CPR will have the greatest impact in the UK, Ireland and Sweden, where CE marking was voluntary under the CPD.

It is imperative that manufacturers of construction products understand the requirements placed on them by the CPR but importers, exporters, distributors, designers, specifiers and builders must also make themselves familiar with the legislation. Many construction product manufacturers will be unfamiliar with the process of CE marking and some will be unaware of the legal obligations now placed on them by the requirements of the CPR.

### What is the CPR?

The CPR, which came into effect on 1st July 2013, had several fundamental aims:

- To break down technical barriers to trade in construction products, enabling free movement of products across the European Union.
- To provide for a system of harmonised technical specifications that have reached the end of the co-existence period.

- To establish harmonised rules for expressing the performance of construction products.
- To set up a framework of Notified Bodies (bodies authorised by the EU to perform testing and certification).
- To enable the CE marking of products.

The building regulations in Member States will still apply. Furthermore, the CPR does not affect the specification of actual construction works because the public and private sectors are free to set their own requirements for the performance of buildings and construction works, and therefore the performance of construction products. However, by specifying CE-marked products, specifiers can be confident that supplied products will consistently meet minimum performance standards.

These minimum performance standards are detailed in harmonised European product standards (hENs) that define methods of assessing and declaring all the essential performance characteristics. These characteristics, required by regulations in any Member State, relate to the ability of construction products to meet basic requirements for construction works, including safety in case of fire.

### Fire Resisting Doorsets

In the UK and Ireland there are two main routes via which a fire-resisting doorset can be supplied and installed within a building to comply with building regulations:



# to CE Marking

**1** The door leaf and its component parts (door frame, hardware, seals etc.) are supplied by different companies under separate contracts for construction and installation on site (door assembly). Not CE markable.

or

**2** The doorset is supplied by one company under a single contract either fully or part assembled for installation on site. Any further works required for the door are typically carried out using basic tools in order to fit the hardware or seals (doorset). CE markable.

The CE marking requirement under the CPR only relates to doorsets that are supplied as a warranted, tested whole from one legal entity or company under a single contract. These doorsets must comply with a range of essential requirements once CE marking of fire resisting doorsets becomes mandatory.

Under the CPR, pedestrian doorsets with fire and/or smoke control characteristics are covered by a draft hEN, pr EN 16034. This has yet to be finalised and it is for this reason that it is not currently a mandatory/legal requirement for manufacturers to CE mark such doorsets in order to place them on the open market. However, when pr EN 16034 is published as a full standard and the co-existence period has finished, all manufacturers of such doorsets must comply with the product standard under the CPR, and CE mark the doorset before placing it on the open market.

Although a co-existence period has been requested, it has not been confirmed how long such a period would be or whether it will be granted. Without a co-existence period (or after it has ceased), technically it will be illegal for a manufacturer to place a fire resisting doorset on the open market without a CE mark.

## The CE Marking Process

Responsibility for completing the various stages of the CE marking process for construction products varies depending on how safety critical the product is. The more critical, the greater 'third-party' involvement is required.

Fire resisting doorsets are deemed safety-critical and as such require a Notified Body, such as BM Trada, to carry out the initial type testing, factory production control (FPC) inspection and ongoing FPC surveillance.

The manufacturer must make a declaration of performance (DoP) for the product before placing it on the market. The manufacturer must then take responsibility for the conformity of the construction product to this DoP. The DoP will express the performance of the construction product in relation to a list of 'Essential Characteristics' defined in Annex ZA of the hEN. These must be referred to both in the DoP and in the CE Mark.

All these characteristics need to be considered by the manufacturer, but there are only a few against which a performance must be claimed. These essential characteristics are mandatory in the UK and, in the case of pedestrian doorsets

with fire and/or smoke control characteristics, include fire resistance performance, smoke control and durability.

A classification document assists with the DoP and, for doorsets with fire and/or smoke control characteristics, BS EN 13501-2 specifies the procedure for classification of construction products from fire resistance and smoke leakage data. A classification document essentially provides information on the tested characteristics of a doorset and the performance that it can provide.

In addition to classification documents, as part of the CE marking process, a manufacturer can extend the scope of application for their product by a direct field of application report (DIAP) or extended field of application report (EXAP). DIAP rules are given in the test standard for the product, which is BS EN 1634-1 in the case of fire performance and doorsets. A DIAP report is generally quite limited in the changes it permits for the doorset design.

An EXAP provides a wider scope of design options and, in the case of fire-resisting timber doorsets, is governed by the rules given in BS EN 15269-3. Smoke control doorsets are governed by BS EN 15269-20. A manufacturer chooses to have these documents written, based on their test results in order to enable them to offer the widest scope of products to the market that can also carry the CE mark. It is possible to classify a product's performance on the back of DIAP and EXAP reports.

As well as the DoP, the manufacturer must also affix the CE mark according to a legal format. It must be attached visibly, legibly and indelibly to the product, its packaging or the manufacturer's commercial documentation accompanying the product. In the case of fire resisting doorsets, a Notified Body must be involved in the factory production control phase and the Notified Body's identification number must also be displayed.

Essentially it is the manufacturer's responsibility to prove that the doorsets with fire and/or smoke control characteristics they are supplying to market meet the necessary requirements as stated in the hEN.

## Be Prepared

With any new legislation there are always questions regarding implementation and interpretation. But by getting a product ready for the market, manufacturers can gain competitive advantage, or at the very least, remain in the marketplace once the legislation becomes mandatory.

It makes sense for all manufacturers of doorsets with fire and/or smoke control performance characteristics to understand the CE marking process and prepare for its implementation. CE marking of certain construction products is already here and, while it is impossible to say for sure what the future holds, it is important to be prepared.

## Frequently Asked Questions

At first glance, the process of CE marking fire resisting doorsets seems very different to the current situation in the UK and Ireland, not least

*All components on a CE marked doorset must be approved suitable for use with the doorset design.*



because of the technical language used. Understandably, manufacturers have many questions regarding compliance with their legal obligations.

BM TRADA has compiled some frequently asked questions received from BM TRADA Q-Mark certified door manufacturers and members of the Architectural Specialist Door Manufacturers Association (ASDMA). The answers provided are to the best of our knowledge at the time of going to press:

- **Who needs to CE mark?**

Manufacturers of construction products that are covered by harmonised product standards (hENs). Fire resisting doorsets that are constructed and supplied to market by one manufacturer will need to CE mark their doorsets under the requirements of hEN 16034 when published.

- **When will it come into effect?**

BM TRADA's current best estimate for pr EN 16034 to become a full standard is May 2015. A co-existence period has been requested but is yet to be confirmed. Once it comes into effect and any co-existence period has expired it will be a requirement to CE mark fire resisting doorsets.

- **I am only supplying the door leaf; will this need to be CE marked?**

No. It will be the responsibility of the doorset manufacturer to use the correct door leaf as tested for the complete doorset. It is not possible to CE mark a door leaf. The door leaf may need to be sampled at factory source prior to testing.

- **If a door manufacturer only supplies the leaf for others to install into a suitable and compliant door frame with appropriate hardware and intumescent seals etc, as supported by the test evidence, is the door manufacturer in contravention of the Construction Products Regulations when they come into force?**

No, this is the definition of providing doorsets as a door assembly. It is BM TRADA's understanding that it will be possible to continue to supply different door components for construction and installation on site from various manufacturers and under different contracts. However, if a CE marked doorset has been specified this route will not be acceptable. It is

likely that the requirement for CE marking will be driven by market requirements.

- **Can I use any CE-marked hinge on fire doors or does it have to be as the tested specification?**

BM TRADA's current understanding is that alternative CE-marked hinges can be cascaded into a doorset manufacturer's EXAP report. However, the test evidence for the hinge must be submitted to the Notified Body writing the EXAP report (a DoP on the hinge is not sufficient as the only documentation) and the evidence for the hinge must be on a door of a similar product family.

- **My proposed hinge blade is bigger than the permitted hinge blade in the EXAP but it is CE marked, will this be acceptable?**

Only if the CE-marked hinge has been tested on a doorset of a similar product family and is subsequently included within the EXAP for the door design.

- **A flush CE marked doorset has been installed but now I need to fit a glazed aperture in it, is this allowed?**

CE marking follows the Chain of Custody approach that those involved with third party certification of products will already be familiar with. CE marking is a declaration by the manufacturer that the products meet basic safety requirements for selling on the open market. If changes are made to the doorset after it has been manufactured and installed the Chain of Custody is broken and any assurances that the product met these performance requirements when it left the factory would be void.

- **I will be manufacturing a CE-marked doorset in a frame with essential hardware but not installing it as it will be painted on site, do I need to CE mark and if so, how do I do this if it is still to be painted?**

If the doorset is constructed and supplied to market by one manufacturer it should be CE-marked. The doorset can then be decorated on site by others.

- **Will architects be required to specify the handles (levers and pulls) tested as part of the CE-marked doorset or will there be an allowance for architects to specify a CE-marked doorset supplied by one company and the handles supplied by another company?**

If the specification calls for a CE-marked doorset, it will have to be provided by one doorset manufacturer who has had the handles considered suitable for use with their doorset design as part of the scope of application using the EXAP process or, if necessary, by testing.

- **External pedestrian doorsets must already carry a CE mark, what if these doors also need to provide fire resistance?**

Until the hEN for fire-resisting doors is published as a full standard it will only be possible to CE mark external pedestrian doorsets to EN 14351-1 and then also declare the fire resistance of the door outside of the DoP. **IFP**

**Peter Barker** is a Senior Consultant at BM TRADA

For further information, go to [www.bmtrada.com/testing](http://www.bmtrada.com/testing)



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# New Technology

## UL-Listed Total Flooding System Sets New Standard



**Scott Starr**

Firetrace International

The launch of a new engineered clean agent total room flooding system that has just received UL Listing means that total room flooding installations no longer have to be more complicated than necessary. Installation costs can now be drastically reduced, previously unattainable design flexibility is also a reality; and installation times have been slashed.

**T**he new engineered clean agent total room flooding system from Firetrace International achieves much of its success by optimising the “industry standard” flow calculation method in order to exploit the superior flow characteristics of 3M™ Novec™ 1230 Fire Protection Fluid.

It delivers a host of substantial and measurable performance enhancements when compared with traditional delivery systems. These include superior performance, greater flexibility, improved value, speedier installation and a measurable competitive edge for system installers. Compared with traditional clean agent total flooding systems, the new E<sup>4</sup> system from Firetrace International requires between 25 percent and 40 percent less piping; delivers a 300-plus percent increase in the horizontal cylinder-to-nozzle distance; the vertical distance is increased by more than 400 percent; and there is a 700-plus percent increase in liquid agent to pipe volumes. The result is the largest possible networks without the need for extra equipment, and lower hardware cost for every square meter of area protected.

The new UL Listed engineered clean agent total flooding system takes full advantage of the unique characteristics of Novec 1230 fire suppressing agent. Novec 1230 is a next generation Halon

alternative that provides outstanding performance, a large margin of safety for occupied spaces and an excellent environmental profile. It is the first Halon replacement to offer a long term, sustainable technology for special hazards fire protection.

The E<sup>4</sup> total flooding systems utilise the latest 34.5 bar total flooding technology that provides impressive performance gains compared with traditional total flooding systems, many of which use conventions developed for Halon systems in the 1980s; conventions that were continued by many HFC and Novec total flooding systems.

Systems are available in eight capacities with fill volumes ranging from 4 kg to 590 kg – the largest cylinder in the industry (the UL Listing applies across the entire range of charging capacities). They offer higher agent fill density (more agent in the same size space) and are capable of massive piping volume capabilities without the need for expensive N<sub>2</sub> drivers and are available with stackable actuator systems, so the remote storage of cylinders is no longer a challenge.

All cylinders can be under-filled in one kilogram increments to meet the exact amount of Novec 1230 required. Nozzles are available in centre and side discharge patterns for pipe sizes ranging from 12.5 mm to 64 mm. The systems can be activated

## Clean Agent Selection

The risk of fire is very real in a data centres or IT facilities; faulty electrical connections, short circuits, thermal overload and power line surges are just a few of the many causes of fires. Quick detection and suppression of a fire is critical for reducing or eliminating downtime. However, it is also critical that the fire suppressing agent has no adverse effect on data centre operations. Firetrace's new total flooding systems use "clean" fire suppressing agents such as Novec 1230. The term "clean agent" is commonly used because these agents leave behind no residue and cause no collateral damage. Clean agents such as Novec 1230 are electrically non-conductive, non-corrosive and can safely be discharged on energised equipment located in occupied areas.

either manually or automatically using mechanical, pneumatic or electrical activation.

The number of tees and nozzles is greatly reduced and the challenge of having to accurately equally balance the amount of agent at Bull T and Side T connections, plus extra pipe lengths between tees are either minimal or completely unnecessary. With E<sup>4</sup>, the Bull T split can be up to a 90/10 split, while the Side T can be up to 50/50 and 93/74 split. The result is an installation that can show more than a 50 percent saving on labour costs through "smart" pipe layouts that are



E<sup>4</sup> systems are manufactured in an AS9100C/ISO 9001:2008-certified facility. They are compatible with most popular releasing panels. Firetrace also offers DuPont FM-200 total flooding systems. **IFP**

**The new UL Listed system takes full advantage of the unique characteristics of 3M Novec 1230 Fire Suppression Fluid and has set a new industry standard for total flooding systems by using low cost, low pressure hardware while delivering performance that has been typically associated with high cost, high pressure systems.**

impossible to achieve with the design limitations inherent in old-technology systems.

System installers' end-user customers also benefit, achieving a much lower financial outlay when compared with other systems on the market, and greatly improved design freedom. For example, with conventional systems the maximum possible cylinder-to-nozzle distance is frequently little more than 20 meters to 25 meters. This often means that cylinders have to be located in the room being protected. However, with E<sup>4</sup> the distance benefits associated with inert gas systems are now achievable with Novec 1230.

It is now possible to protect an entire facility from a single bank of E<sup>4</sup> cylinders. In fact, by merely replacing the cylinders and nozzles, E<sup>4</sup> provides a swift, least-cost transition from most existing Halon systems to Novec 1230 clean agent technology.

Firetrace's E<sup>4</sup> complies fully with every aspect of NFPA 2001: 2012 (*Standard on Clean Agent Fire Extinguishing Systems*) and the European standard BS EN 15004:2008 (*Fixed firefighting systems. Gas extinguishing systems. Design, installation and maintenance*). The system's cylinders are also UL Listed and are manufactured, tested and stamped in accordance with DOT 4BW500 or DOT 4BA500.

**Scott Starr** is Director of Marketing at Firetrace International

For further information, go to [www.firetrace.com](http://www.firetrace.com)

## Case Study:

### Major Federal Data Facility Protected by New UL Listed System

Recognising the need for effective protection against the risk of fire, a new 27,871 square metre federal data facility in the USA is protected using Firetrace International's new advanced UL Listed E<sup>4</sup> engineered clean agent total flooding system. Utilising more than 40,820 kg of 3M Novec 1230 Fire Protection Fluid, the system easily rates as one of the largest "clean agent" total flooding systems ever installed.

A total of 128 Firetrace E<sup>4</sup> clean agent cylinders have been installed, each of which is capable of holding up to 590 kg of Novec 1230 Fire Protection Fluid. The cylinders are deployed in 24 banks that are protecting 12 separate zones throughout the new facility that has been designed, constructed and is operated to achieve a LEED (Leadership in Energy & Environmental Design) Gold certification, which is recognised internationally as the standard for measuring building sustainability.





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# Protecting Steelwork Exposed to Hydrocarbon Fuel

## A New Certification Category for the Protection of Steelwork Exposed to Fires Burning Hydrocarbon Fuels is Now Available from UL.



**Chris Miles**

UL

Over the past two decades, the ANSI/UL 1709 (Rapid Rise Fire Tests of Protection Materials for Structural Steel) test standard has grown in importance across the worldwide petrochemical industry for the hydrocarbon fire protection of structural steel. The standard is currently considered the 'default' standard in many parts of the world, particularly those which actively use guidance for the petrochemical industry published by the American Petroleum Institute (API).

However, legislation and guidance in many parts of the world impose additional requirements on the products that the current UL 1709 test method cannot fully encompass. In order to ensure that UL certification remains relevant to the needs of the industry, UL has undertaken a review of the industry needs and developed a new certification category that includes a wider suite of characteristics for steelwork protection when used in petrochemical type installations. These characteristics will be collated into a certification program as a new UL service provision.

For this reason, and without wanting to add a new requirement, UL 1709 will form the basis of UL's new Hydrocarbon Category.

### Environmental Exposure

Petrochemical type installations are obviously built to exploit the presence of underground natural resources and/or to provide a strategically located onward transport facility for the refined products. Additionally the industrial nature of the facilities can result in a corrosive atmosphere for the building infrastructure.

**ANSI/UL 1709 has grown in importance in the petrochemical industry for the hydrocarbon fire protection of structural steel. It is currently considered the 'default' standard around the world.**

### Mandatory Characteristics

The UL program for the protection of steelwork exposed to fires burning hydrocarbon fuels – such as those found in petrochemical installations – will be based upon the product complying with UL 1709 as a mandatory minimum.

### Fire Exposure

As might be expected for evaluation of products in installations such as those processing hydrocarbon fuels, the test method uses a higher heat and energy than a fire condition based on a 'standard' building fire, which uses a cellulosic fuel source as reflected in ANSI/UL 263 (ASTM E119) (*Fire Tests of Building Construction and Materials*). Therefore the new certification category will be based upon a mandatory requirement of satisfying UL 1709 as a minimum.

UL 1709 was developed specifically to evaluate products subjected to hydrocarbon fires and is widely accepted as the means of evaluating steelwork protection in many regions internationally.

This can, and often does, mean that the facilities are placed in more challenging natural environments such as those that suffer extreme heat and cold or at the edge of oceans that, literally by their very nature, means the products used for the buildings need to be stable when exposed to these environmental factors. This is particularly important if the products are to provide a life safety function such as fire protective materials.

The new Hydrocarbon Category will therefore also include evaluation of the protective coating against the long-term effects of environmental exposure, often a critical factor in the performance of materials in petrochemical installations.

The method is already a mandatory part of UL 1709 and will also be a requirement of UL's new Hydrocarbon Category. In time, these environmental requirements will transition to include a requirement to comply with the development of UL 2431 (*Durability of Spray-Applied Fire Resistive Materials*).

# ork from Fires

## Optional, Additional Characteristics

In addition to the requirement for UL 1709, the scheme will allow for optional characteristics to be included within the product's claim of performance. These characteristics are aspects of protection that are often required of the product when installed in installations such as petrochemical facilities. Mandatory and optional characteristics, which have been complied with, will all be included within the scope of the certification.

## Jet Fire

Due to the pressurised nature of the hydrocarbon fuels within the pipes and vessels within the facility, fires can be of a very fierce nature, even above the temperatures and ferocity of those specified in UL 1709. For this reason an International Standard, ISO 22899 (*Determination of the resistance to jet fires of passive fire protection materials – Part 1: General requirements – First Edition*) has been developed to evaluate protective materials against the temperature and erosive nature of fire emanating from pressurised hydrocarbon-carrying pipes and vessels. These fires, colloquially known as 'jet-fires', have become increasingly specified in the

various temperatures ranging from 371°C to 760°C in increments of 38°C. The ability to have the data analysed using the MTA method will be included as an option within the category.

## Fire Exposure

Products certified under this certification may also be exposed to additional fire exposure conditions. The standards for such elective fire exposures will be included BS 476: Part 20: Annex D.

In some specifications, often for separating bulkheads and decks, the test method referenced in Annex D of BS 476 (*Fire Tests on Building Materials and Structures – Part 20: Method for Determination of the Fire Resistance of Elements of Construction*) is specified as the temperature exposure. Therefore the new certification category will allow for testing to this standard and on these types of constructions as an optional additional characteristic.

## Environmental Durability

In addition to the mandatory minimum environmental evaluation that is included as part of the UL 1709 evaluation, the scheme will allow for

**UL 1709 was developed specifically to evaluate products subjected to hydrocarbon fires. It is widely accepted as the means of evaluating steelwork protection in many regions internationally.**

petrochemical industry and, after discussion with stakeholders, UL believes there is much value in including this optional characteristic within this certification category.

## Multi-Temperature Analysis

The hydrocarbon certification category also includes product design tables for alternate critical core design temperatures. This is achieved by conducting an evaluation of the test data called the Multi-Temperature Analysis (MTA).

The purpose of this analysis is to identify the thickness of coating material necessary to keep a specific substrate below a specific temperature for a specific duration. This philosophy is in line with the philosophy and criteria of UL 263 and UL 1709, but does not restrict the limiting steel temperatures to 593°C/704°C and 538°C/649°C for beams and columns respectively.

The information relating to multi-temperatures is often used in performance-based fire protection applications where a specific fire protection solution will require a specific level of fire protection due to the different heat exposure generated from the anticipated fuel source. In order to accommodate this, alternate critical core temperature designs for the products have been developed at

additional evaluation via Norsok M-501 (*Surface preparation and protective coating*) Revision 5 test method. This evaluation method is increasingly used in the petrochemical industry to evaluate the protective properties of materials and UL has, accordingly, included this testing as an optional characteristic.

## Final Certification

The end result will be a certification coverage that will address the mandatory minimum of UL 1709 and environmental exposure, but can also include other characteristics that the product may have been tested and evaluated against. The resulting scope of certification will be 'listed' on UL's Online Certifications Database viewable publicly via [www.ul.com](http://www.ul.com).

This will enable the products that have certification against this category to be compared side-by-side and their scope of performance to be judged on an even basis. Certification to this category will also provide the end user with reassurance that the performances shown in the certification are evaluated independently by UL, a reputable third-party certification body, indicating that the product is made under regularly inspected factory production controls leading to a consistently manufactured product.

**Chris Miles** is Business Manager, Built Environment Division – Europe & Latin America at UL and Head of UL UK EU Notified Body for Construction Products

For further information, go to <http://industries.ul.com/building-materials/fire-resistive-products/>







**Mark L Robin**

DuPont

# F-Gas Regulation

## Update on the EU F-Gas Regulation & its Impact on HFC-Based Clean Fire Extinguishing Agents.

Since their introduction in the early 1990s, hydrofluorocarbon (HFC) based clean agents have been the most widely specified clean agents for fire protection of sensitive, valuable and mission critical equipment and assets. No other issues related to these agents are perhaps more misunderstood or misrepresented than their environmental impact and the implications of regulations on their use in fire extinguishing applications. In this article, I aim to provide the reader with factual information related to the recently approved European Union (EU) "F-Gas II Regulation" and its impact on the HFC-based clean fire extinguishing agents.

### The EU F-Gas Regulations

#### • Original EU F-Gas Regulation

Regulation (EC) No 842/2006 of the European Parliament and of the Council on certain fluorinated greenhouse gases, the original "F-Gas Regulation," was published on May 17, 2006, and entered into force in 2007. The primary objective of EC 842/2006 was to prevent and reduce emissions of HFCs. EC 842/2006 included requirements related to the prevention of leakage (containment), recovery, personnel training, record keeping, reporting and labelling, all with the goal of the reduction of unnecessary emissions. The regulation recognised that fire suppression applications are essentially non-emissive, and imposed no restrictions on the use of HFCs in fire suppression applications. For a detailed review of the original F-Gas Regulations and HFC clean agents, see the February 2013 issue of International Fire Protection.

#### • EU F-Gas II Regulation

Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No. 842/2006, the "F-Gas II Regulation," was published on May 20, 2014, and will enter into force on 1 January 2015.

### The EU F-Gas II Regulation & Fire Protection Systems

#### • EU F-Gas II Allocation Quotas

A significant change from the original F-Gas Regulation of 2006 is the establishment of allocation quotas. Article 16 of the F-Gas II Regulation establishes an allocation of quotas for placing HFCs on the market in the EU each year; Article 15 requires that producers and importers not exceed their quota. Under Article 16 a reference value, based on the annual average of quantities of HFCs (expressed in terms of CO<sub>2</sub> equivalents) the producer or importer reported to have placed on the market from 2009 to 2012, is calculated in accordance with Annex V of the Regulation; quotas are then allocated employing the reference value and

the allocation mechanism described in Annex VI of the Regulation.

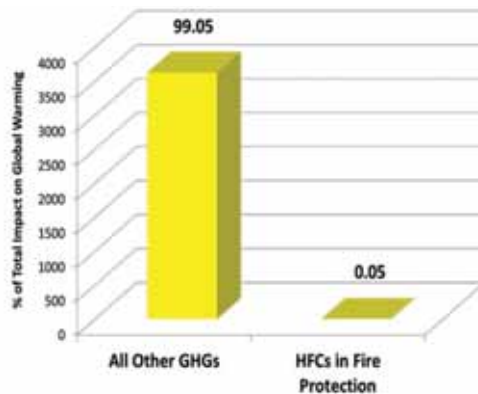
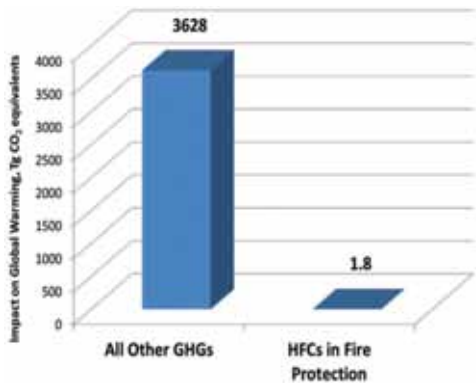
The allocation scheme represents an overall "cap and reduction" of HFCs on a GWP-weighted basis over a specific time period – a "phase-down," not a "phase-out" of HFCs. The phase-down mechanism involves a gradually declining cap on the total placement of bulk HFCs (in tonnes of CO<sub>2</sub> equivalents) on the market in the EU with a freeze in 2015, followed by a first reduction in 2016 and reaching 21 percent of the levels sold in 2009 to 2012 by 2030. An important aspect of this allocation scheme is that it does not restrict the amount of any particular HFC that can be placed on the market or any amount of HFCs used in any particular application; it simply restricts the total CO<sub>2</sub> equivalents of all HFCs that can be placed on the market. Table 1 shows the schedule as indicated in Annex V of the Regulation.

Years	Maximum Quantity of HFCs (based on tonnes of CO <sub>2</sub> equivalents) That Can be Placed in the Market
2015	100% (of 2009-2012 average)
2016-2017	93%
2018-2020	63%
2021-2023	45%
2024-2026	31%
2027-2029	24%
2030	21%

**Table 1. F-Gas II Regulation: Reduction Schedule**

The allocation quota applies to HFCs employed in all applications and is not specifically targeted at the fire protection industry. HFCs employed in fire protection represent only a small fraction of the total HFC industry in the EU, that is, fire protection represents approximately one percent of the EU HFC industry on a mass basis, or approximately three percent of the EU HFC industry on a GWP-

# Update



*Figure 1: Impact of HFCs in Fire Protection on Global Warming: for EU-15 region, the impact of HFCs in fire protection represents 0.05 percent of the impact of GHGs)*

weighted basis [EEA Technical Report No. 15/2013].

Due to the relatively small size of the HFC fire protection industry, emissions from HFC-based fire protection systems are extremely low, and as a result the impact of these emissions is essentially negligible. The most recent data from the European Environment Agency, depicted in Figure 1, indicates that for the EU-15 region, the impact of HFC-based fire protection agents on global warming represents approximately 0.05 percent of the impact of all GHGs [EEA Technical Report No. 9/2014].

Since HFCs in fire protection applications have a negligible impact on global warming, restricting HFC use in fire protection applications would not provide any significant reduction in global warming – for this reason the F-Gas II Regulation does not call for specific restrictions of the three HFCs most widely employed in fire protection (HFC-227ea, HFC-125, HFC-236fa).

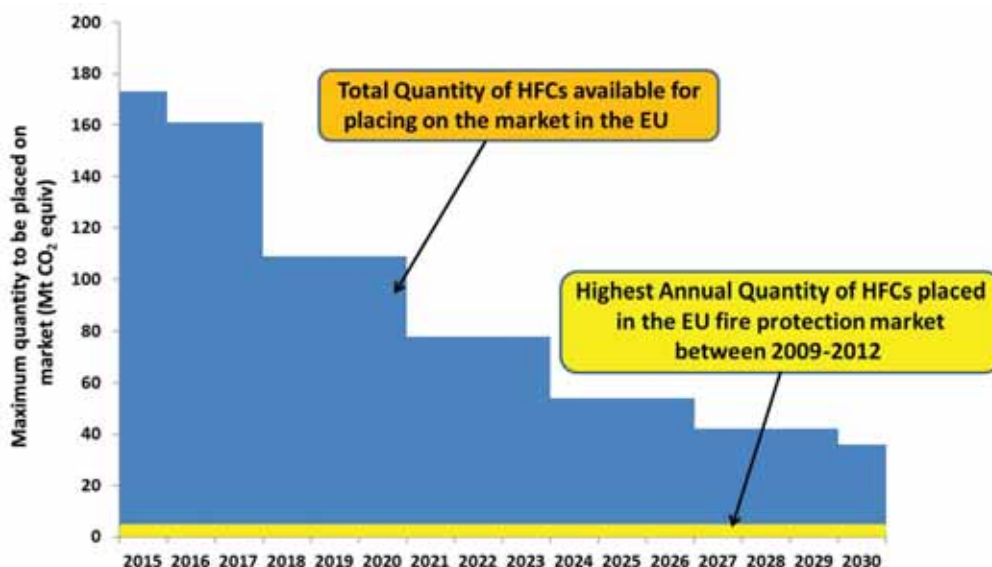
HFCs in fire protection represent only a small fraction of the total EU HFC industry, and subsequently the allocation will not affect the fire sector. Figure 2 depicts the effects with time of the F-Gas II allocation scheme on the quantity of HFCs available for placing on the market in the EU. The HFC phase-down stipulated by the F-Gas II Regulation is unlikely to affect the supply of HFCs for fire protection in the EU market as fire protection

represents only 1 percent of the EU HFC market on a mass basis and 3 percent of the total EU HFC market on a GWP-weighted basis.

Additional regulatory constraints on specific HFCs in refrigeration and other non-fire protection applications, along with the shrinking of the HFC refrigeration market as alternatives such as the hydrofluoroolefins (HFOs) replace HFCs in refrigeration, will result in the further releases of allowances, providing more than enough rights for HFCs used in fire protection. The allocation framework of the F-Gas II Regulation does not inhibit or limit the sale of HFCs into the fire suppression market.

## • Articles Three to Ten

Chapter II (Articles three to ten) of the F-Gas II Regulation combines Articles from the original F-Gas Regulation related to containment, recovery and training; as a result, the requirements of Articles three to ten of the F-Gas II Regulation are already being complied with by the fire protection industry. Requirements related to containment including leakage prevention, repair and inspection schedule are satisfied by the existing inspection regimes established by the ISO 14520, EN 15004 or NFPA 2001 standards. Recovery related requirements are currently being met by the numerous commercial entities already actively involved in the recovery and reclamation of



*Figure 2: Gas II allocation Scheme: maximum quantities of HFC allowed to be placed on the market)*

Table 2. Comparison of Clean Fire Extinguishing Agents – tick indicates desired property

Ideal Halon Replacement	Halon 1301	HFCs	Inert Gases	Perfluoroketones
Gaseous agent	✓	✓	✓	
Low chemical reactivity	✓	✓	✓	
No effect on biological tissues	✓	✓	✓	
Electrically nonconducting	✓	✓	✓	✓
High weight efficiency	✓	✓	✓	
Low agent cost	✓	✓	✓	
High nozzle area coverage	✓	✓	✓	
Low system cost	✓	✓	✓	
Low storage volume	✓	✓		✓
Low number cylinders	✓	✓		✓
Low cylinder pressure	✓	✓		✓
Low manifold pressure	✓	✓		✓
Low enclosure pressure	✓	✓		✓
Zero ODP		✓	✓	✓
Zero GWP			✓	
Non-VOC	✓	✓	✓	

HFC-based clean fire extinguishing agents. Training and certification programs for personnel involved in the handling of fluorinated GHGs have been in place for more than a decade within the fire protection sector. In summary, the requirements of Articles three to ten of the F-Gas II Regulation involve activities already part of any responsible product stewardship program and impose no restrictions on the use of HFC clean agents.

## • Article 11

Under Article 11 of the F-Gas II Regulation, the use of fire protection equipment that contains HFC-23 (trifluoromethane, CF<sub>3</sub>H) is prohibited after 1 January 2016, except in military applications. This prohibition is in line with the intent of the F-Gas II Regulation to avoid the use of certain gases where there are safe and efficient alternative

tion does not specifically target HFCs in fire protection and will not affect the fire sector due to the small size of the sector and the releases of allowances as HFCs in other applications are regulated or withdrawn from the marketplace, providing more than enough rights for fire protection applications.

The emissions of HFCs in fire protection are extremely low, meaning their impact on global warming is negligible. As a result, restricting HFC use in fire protection applications would not provide any significant reduction in global warming and efforts beneficial to the environment are more productively focused on other sectors with much larger impacts. Regulators understand this and as a result HFCs in fire protection are being treated differently than HFCs in other more emissive applications.

## The allocation framework of the F-Gas II Regulation does not inhibit or limit the sale of HFCs into the fire suppression market.

technologies with no impact or a lower impact on the climate. HFC-23 is employed in only a very small selection of niche fire protection applications, primarily involving low temperature environments. The utilisation of HFC-227ea in place of HFC-23 represents an almost 80 percent reduction in potential climate impact based on their respective GWP values. In addition, due to recent advances in chemistry, HFC-23 has been rendered a valuable feedstock material for the production of pharmaceuticals and agrochemicals containing the trifluoromethyl (CF<sub>3</sub>) group [cf., Science, 338, p. 1324, 7 Dec 2012].

## Conclusion

The F-Gas II Regulation recognises the value, importance and non-emissivity of HFC clean agents in fire protection. The Regulation does not call for a ban on the use of HFC clean agents in fire protection nor does it call for a specific reduction in the emissions of HFCs in fire protection applications. The allocation scheme of the Regula-

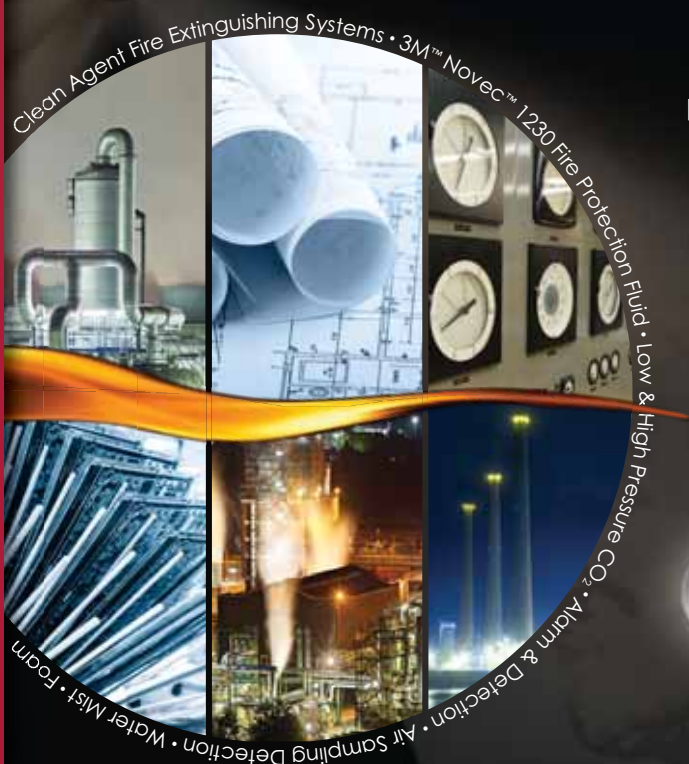
To date no product or technology has been found which satisfies all of the criteria of the ideal Halon 1301 replacement. Each class of clean fire extinguishing agent (HFCs, inert gases and perfluoroketones) has strengths and weaknesses, and clean agent selection must be based on the physical and chemical characteristics of the agent along with detailed knowledge of the specific project requirements. As seen from Table 2, no agent satisfies *all* of the requirements of the ideal Halon replacement; however, Table 2 shows that HFC-based clean fire extinguishing agents provide the best overall combination of the desired properties.

The cap and reduction scheme of the F-Gas II Regulation provides regulatory certainty for the fire suppression industry while allowing users and fire protection engineers to continue to select the most efficient and technically sound fire protection option for critical equipment and facilities – all while reinforcing emission reduction goals, responsible use of clean agents, and global climate change commitments.



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# Kitchen Fire Safety is on the Menu



**Sarah Colwell**

BRE Global

Growth in the restaurant and fast food sector continues apace. But commercial ambitions can be easily devastated by a fire, making fit-for-purpose suppression systems in the kitchen vital to business resilience, and of course, public safety.

**D**espite five years of global recession, restaurants and particularly fast food outlets have bucked the trend and seen relatively healthy growth. Consumer lifestyle in the West continues to embrace eating out and take-out food. Demand is growing, too, in emerging economies such as Africa, Russia, India, as well as China and other parts of the Far East. However, the feel-good story comes with a cautionary note. Fire risks exist in every commercial kitchen.

A report for the National Fire Protection Association (NFPA) found that U.S. fire departments responded to an estimated average of 7,640 structure fires a year in eating and drinking

establishments between 2006 and 2010. These fires resulted annually in two civilian deaths, 115 civilian injuries, and \$246 million in direct damage to property. Cooking equipment was involved in three out of five (57 percent) of the fires.

Cooking materials, principally fats and oils present in deep fat fryers, grills and cooking ranges, are particularly susceptible to ignition. Grease residue on extractor hoods and ducts, fans and grease filters is also flammable, capable of fuelling a fire and precipitating its passage through ductwork.

The effects can reach far beyond the immediate fire and smoke damage to catering equipment and



## KITCHEN FIRE SUPPRESSION



workspace. This in itself can be costly and time-consuming to replace and clean up. But there are potentially much greater impacts. They include disruption of business, loss of revenue and jobs, injury or even loss of life, and inevitable damage to reputation, sometimes unrecoverable. If the kitchen is located within a large complex, a shopping mall, airport concourse or leisure plaza, then impacts can ramify through adjoining businesses and assets.

In 1997, a fast food outlet at London Heathrow Terminal One succumbed to a fire that broke out in the communal roof duct serving a number of food serveryes. It took five hours to extinguish the blaze, leaving the terminal closed for ten hours, 300 flights cancelled and affecting an estimated 45,000 passengers.

In 2009, in Vilnius, Lithuania, a fire started in a deep fat fryer in a restaurant in the Akropolis shopping mall. The flames reached the extraction duct, which was coated in fat, fuelling the fire and allowing it to travel through the duct into the main building, activating 19 sprinkler heads. Some 3,000 people had to be evacuated and the cost to the mall, even though it reopened the next day, was approximately €150,000 (\$207,000).

### Preventable

However, such incidents are preventable through diligent mitigation and management of risks using a combination of measures. These include regular and thorough cleaning regimes in the kitchen, effective management and training of staff, checks on the provision of suitable local extinguishing equipment, and the installation of a fixed suppression system.

Fixed fire-fighting systems must be carefully selected following an assessment of both the risk of fire and the risks associated with the operation of the firefighting system.

Usually installed in the canopies above cooking areas, a pre-engineered suppression system prevents a fire entering the duct and puts it out at source. Effectively, it comprises a series of discharge nozzles over target appliances – such as ranges, skillets, deep fat fryers, high level grilles – connected by pipes to a source of fire suppression agent. Current systems employ a range of extinguishing media including water, chemical and gaseous based systems.

A correctly specified suppression system will

extinguish the fire rapidly, allowing kitchen operations to be fully resumed following removal of the fire source, local clean up and reinstatement of the protection system. Key installations may require a duplicate suppression system so that servicing or re-charging of the activated installation does not interrupt business. Design specifications and performance capabilities for a suppression system may look good on paper. But these need to be backed by third-party approval confirming that the installation will actually perform as required in the event of a fire.

As with any fire safety equipment, specifiers need to scrutinise both the approval standard used to certify the design and performance of a kitchen fire suppression system and the product specifications provided by the manufacturer and installer. This will ensure they fully understand the scope of application and operation of the installed systems to ensure they meet the end users requirements.

While there are a number of test standards available in the market covering the design and performance of kitchen suppression systems, it is important that end users recognise the difference between simple type testing and third-party approval schemes.

Third-party approval schemes such as LPS 1223 offered by the Loss Prevention Certification Board (LPCB) are not just a one-off type test. LPCB schemes provide a robust third-party approval through on-going product and factory production control (FPC) audits to ensure that manufactured systems continue to conform to the design specifications originally tested and certified. The audit process includes site visits to inspect installations and on-going checks of the manufacturer's factory production control and the system's performance.

LPS 1223 sets out the requirements and testing procedures for LPCB certification and listing of fixed fire extinguishing systems for catering equipment. LPCB, part of BRE Global, has over 100 years' experience working with the fire industry, regulators and insurers setting the standards for evaluating the performance of fire protection and security products.

### Key Elements

LPS 1223 tests and certifies a fire suppression system on five key elements. It evaluates the per-

formance of three required design functions: fire detection, annunciation and extinction. In addition, the standard requires compliance regarding two distinct service elements crucial in supporting system performance.

The first is the provision by the manufacturer of a manual with full instructions for system design, installation, operation, recharge and maintenance. Secondly, the supplier must ensure systems are designed and installed by their authorised agents, maintaining an up-to-date list of appropriate engineers and companies. They must also ensure that agents design, install and maintain the suppression system in accordance with the manufacturer's requirements.

The suppression systems must protect the cooking appliance and extractor hood as well as detecting and extinguishing fire in both. In addition, the extinguishing systems need to isolate and shut-down the cooking units while allowing connection to a fire alarm system to annunciate the event.

Both manual and automatic activation (actuation) of the systems is also required. While there are concerns that manual override could be misused by personnel, it is a feature critical to the effective implementation of the kitchen fire suppression system to ensure it can be operated in all eventualities.

Additionally, it must be impossible for the user to isolate the power supply to the suppression system without also isolating power and fuel supply to the catering equipment. For pumped systems, electricity supply should be from a dedicated feed circuit with its own RCD protection.

### Onerous

Performance tests in LPS 1233 are based on subjecting equipment to challenging extinguishing situations.

Tests ensure that certified equipment extinguishes the fire within the system discharge time and that no burning oil splashes out of the appliance as a result of agent discharge. On completion of discharge, equipment temperature must be lower than at the time of actuation and below auto-ignition temperature of the cooking fat used. Successful testing also requires that there is no re-ignition of fire in the catering equipment after discharge of the suppression agent.

LPS 1233 also includes tests to verify distribution balance of discharge agent between nozzles at upper and lower flow rate ranges for the system. Components are also subject to comprehensive testing of pressure strength, corrosion, operation/ageing, thermal shock, clogging in addition to pump running tests, where applicable.

While LPS 1223 provides leading assurance of suppression equipment performance, it must also be supported by rigorous procedures covering training, maintenance and cleaning. Kitchen staff should be trained in how the system works and the procedures to observe during day-to-day tasks to ensure the on-going operation of the system. They should also be trained and shown how operations such as operation of manual activation are undertaken.

As part of the LPS 1223 scheme all system designs, installation, commissioning and maintenance can only be undertaken by the LPCB approved manufacturers' contractors. During any

maintenance of equipment, components must be replaced with approved components to ensure the system conforms exactly to the design and component specification which was tested and approved.

LPCB has an allied test standard (LPS 1263) for the fire performance of grease filters used in commercial kitchen extract systems, to complement the robust fire performance of LPS 1223.

### Modular Kitchens

With the growth in modular kitchens, great care must be taken when rearranging equipment layouts due to changes in kitchen menu or for other operational reasons. By their very nature, kitchen suppression systems are networked in bespoke configurations to cover all relevant cooking appliances and their associated risks. If appliances are relocated, then the suppression system will need to be reconfigured accordingly and possibly extended. Again, this work must be undertaken by the approved manufacturer's authorised installers.

A key design requirement for these systems is the need to protect the discharge nozzles from the build-up of cooking deposits such as fat to ensure they continue to operate correctly; grease residues will build up on the nozzles and pipework of a fire suppression installation over time and will require routine cleaning, just like the appliances and extraction hoods they protect. This task, however, introduces the potential to dislodge nozzles or inadvertently disturb or damage pipework that could affect the performance of the suppression system.

Kitchen house-keeping and staff training should include strict procedures for monitoring grease build-up, implementing timely cleaning and supervising the cleaning methods of in-house personnel or external contractors. If possible, cleaning should be arranged to coincide with maintenance inspections, providing the opportunity for the approved manufacturer's installers to pick up and resolve any issues. Otherwise, management procedures should make extra provision to oversee that cleaning activities avoid damage or displacement to the physical installation.

Loss Prevention Standards such as LPS 1223 are continually evolving to keep in step with changes in industry practice, regulations and technological advances and is currently under review to ensure all aspects of the standard remain effective for current product technology, kitchen installation trends and good practice in fire protection/safety. As with all LPCB fire safety and security standards, LPS 1223 kitchen fire suppression standard is free to download from the Red Book Live website [www.redbooklive.com](http://www.redbooklive.com). A full list of LPS 1223 approved systems can also be found on this website, which is updated daily. It is also available as a freely downloadable App (LPCB Redbook) from iTunes and Google Play.

Implementation of effective fire suppression in the commercial kitchen accounts for a relatively small part of operational overheads. Its failure to perform, however, could lead to devastating impacts and financial losses for a restaurant and neighbouring businesses. In underpinning care of duty and business resilience, there is much to gain from investing in the robust fire performance provided by kitchen suppression systems certified to LPS 1223.

IFP

**Sarah Colwell** is Business Group Manager for fire suppression at BRE Global

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*The Mont Blanc Tunnel fire claimed 39 lives and led to 380 million Euros worth of repairs and improvements.*



**Ali Aleali**

FireVu

# Tunnel Fire Detection

Major road tunnel fires are thankfully rare incidents. Rail tunnel fires rarer still. Yet, when they do occur, the cost can be devastating in terms of the high numbers of casualties, substantial repair costs and significant, often nationally felt economic disruption.

**T**he Gotthard Tunnel fire marked an especially low point in tunnel safety. Considered one of the safest in Europe, the Swiss road tunnel, some 17 kilometres in length had many safety features such as a parallel evacuation tunnel and safety cells every 250 metres. The fire that occurred in October 2001 involved the collision of two trucks just one-and-a-half kilometres from the south entrance.

The crash resulted in an inferno that reached 1,200°C, fusing some 40 vehicles into a molten mass. Thick smoke reduced visibility, hampered breathing and made escape difficult – all but one of the fatalities was a result of the smoke, not the flames. 11 people lost their lives and the economic disruption between northern Europe and Italy was severe. The tunnel had carried 1.2 million lorries and millions of motorists a year. It was the third Alpine road tunnel, in less than three years, to be closed after a major fire.

In May 1999 the Tauern Tunnel fire in Austria claimed 12 lives and closed for three months of repairs. The fire in the Mont Blanc Tunnel, which links France and Italy, burned for 53 hours and was more devastating: 39 people died, the tunnel was closed for repairs for three years while 380 million Euros were invested in repairs and improved safety measures. Repercussions also included €13.5 million (US \$17.5 million) in compensation paid by the Italian tunnel operator and a

custodial sentence for its head of tunnel security.

There was also the Kaprun rail tunnel fire in Austria in 2000 that claimed the lives of 155 people in a matter of a few minutes – there were only 12 survivors.

While tunnel fire safety has undoubtedly improved, often as a direct result of such catastrophes, many countries have neglected to improve safety. Moreover, the danger posed from tunnel fires can never be eliminated. Continual review and improvement, shed of complacency, is essential.

### Specific Dangers of Tunnel Fires

Fires in tunnels present particular dangers, more so than many open air environments.

Firstly, there are the high heat release (HHR) rates. Vehicles release heat far more vigorously in confined spaces than open areas. The HHR is four times as powerful in tunnels as open areas. Tunnel tests show that a car fire can produce 2.5 MW to 5 MW, heavy goods vehicles 20 MW to 30 MW and tankers from 50 MW to as much as 200 MW (as illustrated by the Runehamar Tunnel tests) at the top end of the spectrum. Fortunately steps have been taken to make rail stock less combustible. The compartmentalisation of wagons, the control of combustible material and fixed fire suppression and the implementation of regular fire drill test procedures has improved fire safety levels

for both goods and passenger trains.

There is also the dense smoke, which can be highly poisonous. Mont Blanc's fumes contained cyanide and carbon monoxide. The speed of the smoke outpaced those who decided to run; those that attempted to escape using their vehicles found that the smoke choked off the oxygen to their engines, which ground to a halt.

### Fighting the Fires: The Challenge

When a fire takes hold in a tunnel it presents a number of specific challenges and dangers to fire fighters:

- Incredible heat – in the case of Mont Blanc, it took five days for the tunnel to cool.
- Thick toxic fumes.
- Poor or no visibility.
- Confined operating space for emergency services.
- Airflow that generates aerodynamic disturbance affecting smoke behaviour

We can also add the problems of communication and with international tunnels, different authorities from different jurisdictions and countries, perhaps languages, working together under pressure.

### The Need for Fire Detection Measures & the Response

Tunnel designers have often looked at causes of accidents, which although naturally important are perhaps a distraction from concentrating on fire detection and prevention that can help avoid lethal situations altogether. It is essential that fire detection and prevention systems reduce the risk and enable fires to be contained and extinguished before developing into unstoppable infernos.

Indeed, a new EU directive (2004/54/EC) that came into force at the end of April 2014 is a very positive step. In terms of incident and fire detection monitoring, systems need to be implemented for tunnels over 500 metres long. For those over 3000 metres, video systems are mandatory.

Yet, it must be stated that many countries and regions outside the EU have very poor standards of fire detection and prevention. As road and rail tunnel fires are rare occurrences, only the terrible experience and pressure resulting from a major catastrophe is likely to be a catalyst for change.

### Safety Legislation & Regulation

There are no globally-binding guidelines for road or rail tunnel safety.

The integration of the EU has enabled it to implement binding safety regulations for an area encompassing 500 million people for road tunnels. However, most regions do not have the level of integration and co-operation to bring about better fire safety measures. Rail tunnels are not covered in the same way, even in the EU. The EU's technical standard "Safety in Railway Tunnels" is a framework standard rather than a specification. The NFPA 130 does not cover the issues of fire safety in rail tunnels.

Research and the identification of suitable regulations continue to be pursued by The International Tunnelling Association's Committee on Operational Safety of Underground Facilities. Both the International Tunnelling Association (ITA) and the World Road Association (PIARC) have published guidelines and best practices for the safe

construction and operation of tunnels, but these are non-prescriptive.

It is not an encouraging picture for solid forward thinking change that will save lives and property.

### Fire Detection & Suppression in Practice

Many fires start with a smouldering phase. At this stage fires can be dealt with, even by non-emergency staff, contained and extinguished before disaster unfolds.

Fire detection systems need to recognise danger early. Suggested solutions that rely on heat activation alerts generally take too long. For example heat sensing cable that short circuits when the thermoplastic melts and raises the alarm. Moreover, such systems provide no visual information to help tackle the blaze. There are other systems that can be considered such as infra-red, air sampling and other linear detection systems in addition to the above that include optic sensors.

Visual Smoke Detection (VSD) solutions are possibilities that can be considered to provide early warnings. VSD uses changes in its wide field of view to alert operators, remotely or on site to potential fire danger. Visual verification aids operators gauge the level of danger and guide the response. Potential interference to fire detection such as car fumes and the movement of vehicles do not affect its effectiveness.

Our controlled tests at the Sydney Harbour Tunnel in Australia, using a vehicle fire generating temperatures in excess of 500°C generated an alert after just 14 seconds with a further 30 alerts during the test using a VSD solution.

Let us not forget about fire suppression solutions, which can be used effectively in conjunction with fire detection solutions:

- Sprinklers, standpipes and hydrants.
- Deluge, possibly with foam.
- Water curtains – efficient at blocking flames spreading and good for compartmentalising fires, protecting tunnel structures and facilities and cooling temperatures.
- Water mist.

Other steps such as those introduced by the Mont Blanc authorities, for instance checking trucks before they enter the tunnel are to be commended. Educating tunnel users on how to deal with fire situations is highly valuable in minimising risks and consequences. Some operators regulate the number of goods vehicle that can use a tunnel at any one time.

With all systems there needs to be co-operation towards finding the best solution for each tunnel from fire engineers, emergency services, government agencies, tunnel workforces, owners and other parties.

### Conclusion

Fire detection and prevention are not extras but essential tools to protect tunnels and their users from catastrophe. The possible cost in lives, property loss and disruption caused means that investing fully in fire protection measures is a sound use of funds.

Tunnel fires can be tragic, terrifying and costly but above all predictable. The technology has matured, is proven and available to provide very early warning of fire which ultimately saves lives.

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David Staddon and Mark Seton

### Group Editor

Graham Collins

### Contributing Editors

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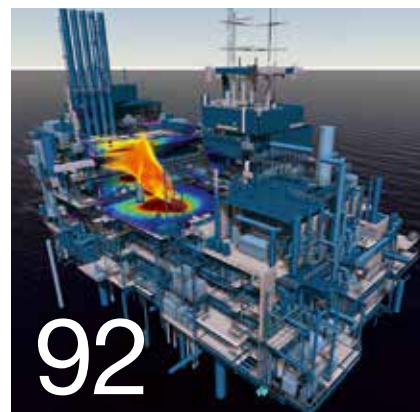
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# It All Comes Down to Making the Right Choices

I am a confirmed believer that just about everything in life comes down to making choices. Even when we think we have no other options, something else is invariably available, even though it may be unpalatable. And decisions regarding issues surrounding fire protection are no exception.



**Graham Collins**  
Editor of *International Fire Protection Magazine*

Choices are being made every day: which detection system to select; what training do staff need; who is responsible for getting it right; should I find out more; is cost the main decision driver? If the list seems endless, it is because it is.

In the four-and-a-half years that I have been editing *International Fire Protection* I have come to realise that fire safety comes down to making the right choices. So in this edition, which is my last as Group Editor of MDM's titles, I would like to argue my case.

If you doubt its validity, just consider any of the fires in which you have been involved in your working life. I contend that in every case the cause of the fire, its growth, impact on the building, or the consequences for the people caught up in the blaze are a direct result of one or more choices made somewhere by somebody. It might have related to ineffective passive protection measures, opting for a traditional sounder alarm system rather than a voice alarm, not revisiting a risk assessment when the building use changed, not reviewing the building's acoustic performance when wall

or floor coverings were altered, or paying insufficient attention to escape routes.

Of course, and very sadly, some highly regrettable choices are down to what can only be described as greed or a criminal disregard for human safety. All too often we read about overcrowded nightclubs, pyrotechnic displays inside buildings and locked or inaccessible escape routes. But these aside, how do the "innocent" bad choices in our industry come about? There are any number of possible reasons: inexperience; financial pressures; competition; shortage of time; sheer habit; lack of knowledge and even complacency.

Perhaps one way of improving fire protection choice making is closer engagement between all of the parties involved – the building owner, occupier, architect, builder, fire engineer, interior fitting-out company, detection and alarm system manufacturer, installation designer, installation contractor and system maintainer – whereby each has the opportunity to ask the others the searching "what if" questions. We have gone some way towards this with the handing over of system and maintenance documentation, but is that enough? After all, it is all too easy to treat that as a responsibility passing exercise.

I am reminded of an experience I had many years ago while living and working in Japan. It has nothing to do with fire safety but, I think, illustrates my point. I was involved in the launch of a new product and, at a

meeting with well over a dozen employees of the Japanese partner company, we discussed the details of the product about to be launched. Not all of those present spoke by any means so, after the meeting, I asked my Japanese colleague who these people were and why they were at the meeting. I particularly asked about one rather timid looking guy who sat quietly and deferentially throughout the meeting. His reply has a message for us all; he told me that that man ran the mail room. To my inevitable next question, why was he at the meeting, he told me that the company always involved everyone that had a role to play in a venture's success. After all, he pointed out, the launch might fail if the product could not cost effectively be packaged and mailed, and who best to know than the man doing the work.

Surely it is the same with a fire safety solution? Perhaps, for example, the building occupier ought to have the opportunity to question the fire engineer's evacuation strategy; and perhaps the maintenance contractor should be able to quiz the occupier about post-occupancy access? Perhaps better choices would be arrived at; and perhaps we would get safer buildings.

Finally, I would like to thank all of the contributors I have had the pleasure of working with, and I hope we will meet again, as I am planning to stay closely involved in this fascinating and vitally important industry.

---

**I have never forgotten what a senior police officer once told me: 'There is no such thing as an accident; somebody made the wrong decision, they decided not to take sufficient care. It did not just happen'.**



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# Commitment to Global Outreach

For the past 18 months, I have had the opportunity to travel the world as NFPA's global ambassador. I have presented at conferences, visited fire academies and firehouses, met with other standards developers, engaged with NFPA's international chapter members, and shared ideas with fire safety leaders.



**Donald P. Bliss**  
Vice President, Field  
Operations, at NFPA

I have seen a remarkable similarity in the serious issues challenging the fire service worldwide, whether in Belgrade or Boston, Dubai or Denver, Rio or Raleigh. High-rise fires, wildland / urban interface issues, "smart" firefighter technology, green building designs, terrorism, natural disasters, alternative-fuel vehicles, firefighter safety and health, public education, code enforcement, and the need for up-to-date fire safety codes and standards are issues shared across borders and across cultures.

NFPA continues to make a significant investment in its mission to "reduce the worldwide burden of fire." NFPA standards are in use throughout the globe in at least 12 languages. We support participation in the NFPA standards development process with an online platform that can be accessed from anywhere in the world. The Fire Protection Research Foundation ([nfpa.org/foundation](http://nfpa.org/foundation)) shares research activities and findings with a global

network of academic and research organisations. And we are active participants at numerous conferences and symposia, as well as international fire safety organisations such as the Confederation of Fire Protection Associations-International ([cfpa-i.org](http://cfpa-i.org)), the International Association of Fire and Rescue Service ([ctif.org](http://ctif.org)), Metro Fire Chiefs ([nfpa.org](http://nfpa.org)), and the Organizacion de Bomberos Americanos ([bomberosamericanos.org](http://bomberosamericanos.org)).

Information sharing is not a one-way street, and there are important lessons to be learned from our international partners. The Singapore Civil Defence Training Academy, for example, is using state-of-the-art simulators to train fire incident commanders in real-life scenarios, and provides training to firefighters in a number of developing nations. The Frankfurt-am-Main Fire Brigade in Germany collects and bags personal protective equipment after a fire, but before firefighters return to the station, in order to minimise their exposure to carcinogenic chemicals. SP Technical Research Institute in Sweden has conducted full-scale tests of fires in road and rail tunnels, and that research has resulted in changes to NFPA 502, Road Tunnels, Bridges, and Other Limited Access Highways. The Australian fire services have taken a leading role in developing new tactics and strategies for

handling major wildland fires. These are just a few examples of initiatives that can be shared, adapted, and implemented anywhere in the world.

Much more needs to be done to engage the global fire protection community in collaborative efforts to reduce fire deaths and property loss. NFPA is currently re-assessing its international strategy, with the vision of being the authority on fire, electrical, and building safety that makes a difference in reducing the worldwide burden of fire and other hazards. We will continue to strengthen our global partnerships with the fire service, fire protection associations, standards developers, and other non-governmental organisations.

Perhaps most importantly, we have the capability – and a moral and professional obligation – to commit resources to assist developing nations in building a culture of fire safety. With more than 100 years of experience, NFPA is in the perfect position to share its codes and standards, research, public education resources, and experience in the adoption and enforcement of fire safety standards with those nations with the highest rates of fire death and property loss. In this age of an increasingly interconnected world, those are burdens we all share.

**For further information, go to  
[www.nfpa.com](http://www.nfpa.com)**

**NFPA continues to make a significant investment in its mission to 'reduce the worldwide burden of fire'. NFPA standards are in use throughout the globe.**

## Right Royal Detection

APOLLO fire detection technology has been chosen to protect the historic 821-pupil King's School, which sits in the grounds of the Canterbury Cathedral in Kent in the UK. The school is thought to be the oldest continually-operating school in the world and, as such, protecting property as well as life is of utmost importance to preserving this significant piece of educational history.

As part of the ongoing refurbishment

of all of the fire detection systems within the school, more than 150 Apollo XP95 units were recently installed throughout the Meister Omers building, one of the boys' houses at the school. The system is supported by a Kentec Syncro AS control panel that monitors 16 zones on a single loop.

**For more information, go to**  
**[www.apollo-fire.co.uk](http://www.apollo-fire.co.uk)**



## Alarm Devices are VdS Approved

EATON has announced that its Fulleon business has been granted VdS certification for its LX range of visual alarm devices, certifying that the LX range now meets Germany's highest product standards in fire protection and safety technology.

The LX range was introduced initially to meet the requirements of the recently enforced EN 54-23 standard, a uniform standard for visual alarm devices (VADs) to improve life safety in high noise areas and increase notification for the hearing impaired. The EU standard, which came into effect in January 2014, requires

that a light level of 0.4 lux per square metre is dispersed across the entire area. According to Eaton, the range was developed to provide the lowest possible current consumption while still giving the highest possible light output to allow a greater number of devices on a circuit.

The range consists of six products comprising of wall-mounted devices and ceiling application devices, all of which boast coverage of 7.5 metres.

**For more information, go to**  
**[www.cooperfulleon.com](http://www.cooperfulleon.com)**



## New Extended-Coverage Sprinklers

GLOBE FIRE SPRINKLER CORPORATION has added the GL series 5.6K extended coverage light hazard (ECLH) sprinklers to its current line of 8.1K and 11.2K extended coverage sprinklers. The new sprinklers are aimed at light hazard applications such as schools, offices, theatres, and hospitals, in accordance with NFPA 13.

The company reports that, compared with the maximum coverage area of 20.6 square metres provided by standard coverage sprinklers, Globe GL 5.6K

ECLH pendent sprinklers protect areas up to 37.2 square metres. This lowers the cost of a sprinkler system by reducing the number of branch lines, sprinklers, and installation hours.

The sprinklers are available in two configurations. The GL5614 ECLH is available in pendent and 19mm-adjustable recessed pendent configurations with standard finishes of brass, chrome, and white. The 25mm GL5603 ECLH concealed pendent features a flat plate. In its 'set' position, the flat profile cover

plate remains flush with the finished ceiling, concealing the sprinkler above. In a fire condition, the cover plate falls away, allowing the deflector to drop into place and the sprinkler to operate. It features a full 25mm of vertical adjustment, ensuring a shadow-free fit to the finished ceiling. In addition to standard finishes of white and chrome, cover plates can also be custom finished to match virtually any colour.

**For more information, go to**  
**[www.globesprinkler.com](http://www.globesprinkler.com)**



# Introducing EN12845 FIRE PUMP LINE



Patterson Pump Ireland Ltd. specialises in the production of world class fire protection equipment around Europe.

From enquiry stage, right through design, manufacturing, installation and after sales service, Patterson Pump Ireland strives to provide a quality, reliable fire protection system, at the most competitive price.

EN12845 provides a pan-European standard for the design, installation and maintenance of automatic sprinkler systems, and encompasses the basic requirements set forth by local rules into one European Standard.

The new Patterson Pump End Suction product line is the latest addition to the Patterson Sentinel™ range. Cost effective and efficient, these will be used in fire pump packages specifically designed and built to comply with the regulations of European standard EN12845, along with other local rules.

#### PATTERSON PUMP IRELAND LIMITED

A Subsidiary of Patterson Pump Company U.S.A.  
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## New Fire-Rated Coatings from PPG



PPG has announced the release of new products within its Steelguard range of intumescent fire protection coatings for steel structures. Designed for use on I-section beams and solid columns, Steelguard 701/801 has been developed to target 30-minute and 60-minute fire scenarios with lower film thicknesses. Steelguard 702 is designed specifically for application on hollow sections, for fire scenarios up to 90 minutes.

Steelguard coatings are designed to deliver fire protection for civil buildings and are claimed to be particularly appropriate where exposed steel structures have been used as part of the design, such as in shopping centres, airport terminals, sports stadiums and schools. Both Steelguard 701/801 and Steelguard 702 are certified to EN13381-8 and BS476.

Steelguard 2458 topcoat enables application of up to three coats in one day. Another advantage cited for solvent-based Steelguard intumescent coatings is that the coating can be left externally exposed for up to 12 months without top coating, provided they are not subjected to ponding, running water or immersion.

**For more information, go to**  
**[www.ppg.com](http://www.ppg.com)**

## Control Panels get the Green Light

KENTEC Syncro analogue addressable control panels, supported by Hochiki ESP protocol fire data communications, are at the heart of a new L1fire system that is protecting the £180 million upgrade of London Underground's (LU) Neasden, North West London train depot. This is described as a state-of-the-art complex for the cleaning and maintenance of its new S-stock trains, and where whole trains can be raised, allowing mechanics and engineers to work beneath them.

The size and complexity of the site required a range of different product solutions. To cope with the exceptionally high ceilings of the depot's sheds aspirating smoke detection (ASD) was specified, in areas where personnel are required to wear ear defenders due to ambient noise, xenon sounder beacons with a voice alarm system were installed.

**For more information, go to**  
**[www.kentec.co.uk](http://www.kentec.co.uk)**



# Kingspan Tarec CPD Uses The Cloud

KINGSPAN TAREC'S CIBSE approved CPD seminar now uses cloud based technology Prezi, to examine how high performance insulated pipework systems can benefit the fire safe design, construction, maintenance of energy efficient buildings.

The CPD provides an overview of the different HVAC / building services insulation options before focusing on premium performance phenolic systems, which offer the lowest lambda of any regularly used solution. As a result, the desired thermal performance can be met with a minimal product thickness, resulting in lighter solutions which can be installed more quickly and allow pipework to be designed and fitted closer together.

The seminar takes an in-depth look at the superior fire and smoke performance that these systems can offer. As thermoset insulation is hard to ignite and does not melt or drip, the premium phenolic systems can achieve a Euroclass rating of BL-s1,d0 and a Flame Spread Index of  $\leq 25$  when tested to ASTM E 84. Products such as Kingspan Tarec Kooltherm FM Pipe Insulation are also approved by FM Global to Approval Standard Class 4924, providing further peace of mind to building owners.

All aspects of compliance are reviewed within the seminar including the latest regulations; and an overview of the Enhanced Capital Allowances and long-term cost savings which can be achieved by insulating pipework to higher specifications such as NES Y50 Enhanced.

Kingspan Tarec provides free, expert advice and guidance on everything from the latest regulatory requirements and best practice to detailed project specific advice and solutions, via its Pipeline Technical Advisory Service. To contact the technical support team call: 0808 168 7363.

**For more information, go to**  
**[www.kingspantarec.com](http://www.kingspantarec.com)**



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**Manual call points:** break glass, push button and tool reset options.



**Global product availability with a 5 year warranty.**



[www.e2s.com](http://www.e2s.com)

## New ASD Unveiled

APOLLO FIRE DETECTORS has added an EN54-20 approved point-based aspirating smoke detector (ASD) to its range of specialist detection products. It has an IP65 enclosure, which provides protection against ingress from the environment. The code protection controls and bespoke removal key provide protection against vandalism and tampering.

Available in two variations, both use Discovery optical detectors and are fitted with a mini-switch monitor that allows for the monitoring of fail-safe fault relays. A maximum of 50 metres of sampling pipe can be utilised on a single chamber (ASD-1) and the dual version of this product allows for two 50-metre sampling runs (ASD-2). It is designed to operate in a wide range of environments and is often used in secure facilities where anti-ligature and anti-vandal are requirements;

in lift shafts where access is difficult;  
in wet or dusty environments or  
in clean environments  
where access is restricted.



For more information, go to  
[www.apollo-fire.co.uk/discoveryasd](http://www.apollo-fire.co.uk/discoveryasd)

## New Door Closer

Agrippa, a new wire-free, digital fire door closer that uses technology to 'learn' the sound of a specific fire alarm and releases the door in the event of a fire has been launched by GEOFIRE. Easily retrofitted to any door, the closer is swing-free too, making the door light to handle and a simple answer to legally holding open fire doors to ease access.

The Agrippa's closing speed is adjustable, with a holding angle of 65 degrees to 105 degrees, and it can be programmed for daily release. It requires only two C cell batteries (that last for 12 months). The closer is approved to EN1155, EN1154 and CE Marked, with additional features that include a seven-segment LED display, manual release button and a low battery warning display.

For more information, go to  
[www.geofire.co.uk](http://www.geofire.co.uk)



## Nuclear 'First' for ASD System

HONEYWELL's FAAST is being heralded as being the first aspiration detection system to be approved by one of Europe's leading nuclear power plant (NPP) operators for installation in its facilities' most demanding locations – the reactor building.

Equipment installed in enterprise-critical locations in NPPs has to conform to extremely stringent specifications, requirements which have recently been significantly tightened in the wake of the Fukushima disaster. For the fire detection system, fast response and approaching 100 percent immunity to false alarms are the most critical operational requirements. Taking a single reactor off line for a day can cost upwards of € million in lost output, even before the additional costs of powering down and re-commissioning the reactor core are considered.

FAAST devices were subjected to nine extended extreme environmental tests covering vibration, temperature and humidity – achieving a 100 pass rate. These tests included: seismic testing to Richter Scale 9; high frequency vibration testing; extreme temperature test at plus 65 degrees C and minus 28 degrees C; rapid temperature changes fluctuating from minus 25 degrees C to plus 70 degrees C; dry heat endurance at plus 70 degrees C; damp heat endurance at plus 70 degrees C with 95 percent condensing humidity; cold test, minus 25 degrees; radiation test, exposure up to 140 Gray; and multiple power up/power down.

For more information, go to  
[www.faast-detection.com](http://www.faast-detection.com)



# A New, Revolutionary Fire Extinguishing Agent



**D**upré Minerals' AVD (Aqueous Vermiculite Dispersion) is a revolutionary fire extinguishing agent designed for flammable metal fires, specifically Magnesium powder and Magnesium swarf. It offers significantly superior performance across the flammable metal range and has key benefits over existing solutions. Dupré have proven that AVD is more effective at extinguishing metal fires, especially Magnesium, than conventional extinguishing agents.

## What is AVD?

AVD is an aqueous dispersion of chemically exfoliated Vermiculite. Vermiculite is the name given to a group of hydrated laminar aluminium-iron-magnesium silicates. Raw Vermiculite consists of thin, flat flakes containing microscopic layers of water. When Vermiculite is exfoliated, either thermally or chemically, the microscopic layers of water are removed and this either causes expansion (thermally exfoliated) or creates microscopic, individual platelets that are freely suspended in water (chemically exfoliated). AVD is approximately 20% Vermiculite / 80% Water with a viscosity of 3000 cPs and a D90 of 180 microns (0.18mm). AVD is non flammable and has excellent insulation properties.

## How does AVD work?

Due to the reactivity between a flammable metal fire and water, AVD

is applied in the form of a 'mist' or 'foam'. The Vermiculite particles within the mist or foam are deposited on the surface of the burning fuel to create a film over the top of the fire. This film instantly dries and because the high aspect ratio platelet particles overlap and bind together, they produce a non flammable oxygen barrier between the fire and the atmosphere.

This process offers cooling to the surface of the fire and as the AVD platelets begin to build up they form an oxygen barrier over the fuel source, the fire is gradually cooled and brought under control. Unlike other Class D Extinguishing Agents where the fire has to be left for long periods of time before the fire is truly under control and completely burnt out, AVD offers quicker control to the fire.

## What are the benefits of AVD?

AVD is suitable for both portable and fixed installations due to its fluid nature and a smaller volume of agent is required to extinguish the fire compared to conventional agents. The Vermiculite platelets within the AVD create a fire proof high insulation oxygen barrier that extinguish and not just suppress the metal fire whilst the water content cools the fire source.

AVD can be used in a Misted or Foamed format depending on the application and to date we have tested AVD in the following deployment systems:



- ✓ Portable Extinguisher Bottles
- ✓ Back Pack Extinguishers
- ✓ Trolley Based Extinguishers
- ✓ Fire Service Pump Systems
- ✓ Fixed Installation

In addition to its performance on metal fires AVD can also be used to extinguish Class A materials such as wood and plastic. The excellent re-ignition prevention properties of AVD provide a flame proof barrier to almost any substrate allowing the spread of fire to be contained.

**For more information, go to [www.avdfire.com](http://www.avdfire.com)**



1  
Flammable metal fires such as magnesium, can burn up to 3,000°C.



2  
AVD is applied. The water content of AVD cools the fire source.



3  
The Vermiculite platelets build a eramic type oxygen barrier on the fuel source stopping the fire and smoke/gas generation.



4  
Further AVD particles fall on top of the solidified AVD crust, boiling off any water content and cooling the fuel source.

## Advanced Pipeline Protection

ADVANCED has announced that its Axis EN intelligent fire systems and ExGo extinguishant control panels.

Panels have been selected to protect critical control buildings and pumping stations infrastructure along a 1,600km stretch of the Sudanese Petroleum Pipeline Company's double oil pipeline. The line runs 800km from Khartoum, the country's capital, to Port Sudan.

Axis EN is Advanced's EN54 two, four and 13 approved fire system. It is available in one to eight-loop formats as standard, and supports up to 240 devices on each loop. 200 panels can be easily networked together in standard or fault tolerant configurations. Axis EN includes a full range of modules, peripherals and intelligent field devices, including a complete wireless range, and is claimed to be one of the few fire systems with full approval to EN54 Part 13. It is configured and maintained with Advanced's Dynamix tools fire panel software.

ExGo is Advanced's extinguishant and suppression control system, which has been developed specifically for sensitive and strategic assets such as server rooms, historic and cultural attractions and control rooms. It has been installed in buildings across the

globe, including the Khartoum-Port Sudan Pipeline, where it has been linked to an AIRfire inert fire suppression system using IG-100 agent. It is suitable for almost all single-flooding area applications and includes a range of control options and devices. It is approved to EN54 parts 2, 4 and 13 and EN12094-1 and is among

the first systems to combine these with EN12094 Part 3 in a single solution.

ExGo can be integrated into Advanced's Axis EN fire systems or any third-party fire alarm system.

**For more information, go to [www.advancedco.com](http://www.advancedco.com)**



Image courtesy of Advanced (Picture for illustration purposes only)

## LPCB Approval for Kitchen System

FIREDETEC has announced that its fire suppression system for commercial kitchens has received LPCB (Loss Prevention Certification Board) certification and is now listed in the LPCB's Red Book that is available free of charge to installers and users throughout the world. It satisfied or surpassed all the requirements of LPS 1223, the standard that establishes the requirements and test procedures for LPCB approval of fixed fire extinguishing systems that protect kitchen equipment such as deep fat

fryers, other cooking appliances and extraction systems.

Key requirements of the LPS 1223 include automatic system actuation and reliable suppression under severe conditions. FireDetec's technology uses pneumatic sensor tubing that is effective and easy to install in the extraction hood and ductwork above cooking areas. As required for LPCB approval, it operates reliably under extremely high heat locations, such as when there is a fire in a deep fat fryer.

LPCB approval is the latest

certifications held by FireDetec and its parent company, Rotarex, which include UL (Underwriters Laboratories), FM (Factory Mutual) and SP (the SP Technical Research Institute of Sweden) approval.

**For more information, go to [www.rotarex.com](http://www.rotarex.com)**

# False Alarm Management (FAM) Solution from Advanced

ADVANCED's AlarmCalm's combination of panel firmware, powerful configuration software and intelligent, loop-powered alarm acknowledgement devices delivers a complete solution to false alarm management that will suit almost any building or site strategy and promises to radically reduce false alarms.

**A**larmCalm provides total control over alarm verification periods and investigation delays to outputs. It allows a site to be divided into false alarm management zones called Building Areas (up to 200 per panel or 40,000 per network). These are virtual areas that can be independent of fire zones and can share grouped or have individual FAM settings. There is no limit to the number of points in a Building Area and every device in the area can be configured precisely.

Alarm verification is one of the key areas of FAM and AlarmCalm facilitates this in a number of ways. Verification settings for a site can be applied incredibly quickly by assigning all common areas of a building with group settings, while allowing specific areas to have individual settings. Verification can be set to on or off, with different settings for day/night operation. Verification can be set quickly according to device type in each Building Area. Heat, smoke, multi-sensors and other inputs (call points or any input modules) can be used as verification inputs and set by device type or individually per point.

Once a signal is detected, AlarmCalm starts a programmable 'stage one' verification time. At the end of this time, if the signal is still present, the system will go into full alarm. During this time the signal can be confirmed by mode or sensitivity change, for example an optical heat detector switching to heat to verify the signal, or by coincidence detection.

Verification can occur simultaneously in multiple areas and users can set the maximum number of Building Areas in verification at any one time before a full fire condition is indicated. There is growing awareness of the role that residents can

play in unwanted false alarm reduction, especially in HMOs (houses of multiple occupation), student accommodation and apartment buildings.

Advanced's new intelligent, loop-powered Alarm Acknowledgement device, the AlarmCalm Button can be used by residents to manually verify an alarm signal is due to an issue in their property that they believe is a false alarm, burnt toast or shower vapour are common culprits. By pressing the AlarmCalm Button, a resident initiates a 'second stage' verification time and (optionally) the local sounder can be silenced. If after the second stage time the signal has cleared, the system will reset to normal conditions; if the signal in the detector is still present, a full fire condition will be signalled. During the second stage period, a fire condition is also indicated if the alarm is confirmed by another method such as sensitivity change or second detector.

AlarmCalm Buttons can extend verification time only once (before a system reset). If the burnt toast becomes a real fire, a full fire condition will be signalled.

Advanced believes AlarmCalm is the easiest installed and configured FAM system available. AlarmCalm Buttons are

easily installed on the loop and recognised in the panel software on auto learn. They are compatible with a standard UK single-gang back box, can be flush or surface mounted and include a configurable LED, buzzer and slide in label.

Sounders, beacons and relays in each Building Area can be operated during the verification period and can be quickly set by all devices of each type or individually by point. Sounder ringing styles are also fully configurable and can utilise a different tone during verification and alarm periods. The same approach in the software is taken with Investigation Delays to Outputs, meaning a full FAM strategy can be easily set up and configured.

AlarmCalm builds in a number of fail-safes to ensure misuse cannot delay a full fire condition, from full control of verification times to automatic detection by sensitivity change or an additional device. It promises to radically reduce false and unwanted fire alarms and is currently available on Advanced's EN54 2, 4&13 approved MxPro 5 and Axis EN fire systems.

**For more information, go to [alarmcalm.advancedco.com](http://alarmcalm.advancedco.com)**





## Foam Concentrate Receives Award

Firefighting foam concentrate and system hardware company, THE SOLBERG COMPANY, has been named as a winner of the 2014 EPA (the US Environmental Protection Agency) Presidential Green Chemistry Challenge Award. The company achieved the Designing Greener Chemicals category award for its development and commercialisation of its Re-Healing foam. Re-Healing foam concentrates are an environmentally sustainable fluorosurfactant and fluoropolymer-free firefighting foam used to extinguish Class B fuels with no environmental concerns for persistence, bioaccumulation or toxic breakdown.

For more information, go to [www.solbergfoam.com](http://www.solbergfoam.com)

## New Modelling Software

GEXCON has launched, FLACS-Fire, which it says is tailor-made for the oil and gas, processing, and industrial sectors, combining “optimal usability with an unparalleled ability to generate detailed models of jet and pool fires”.

The extensively validated, Windows and Linux-supported package models a wide range of scenarios, including, but not limited to, jet fires in cross winds, flash fires, over ventilated compartment fires, and large-scale field experiments. Typical application areas include escape route impairment (modelling heat, smoke and visibility), vessel heat-up modelling, offshore and onshore installations, and factory building fires.

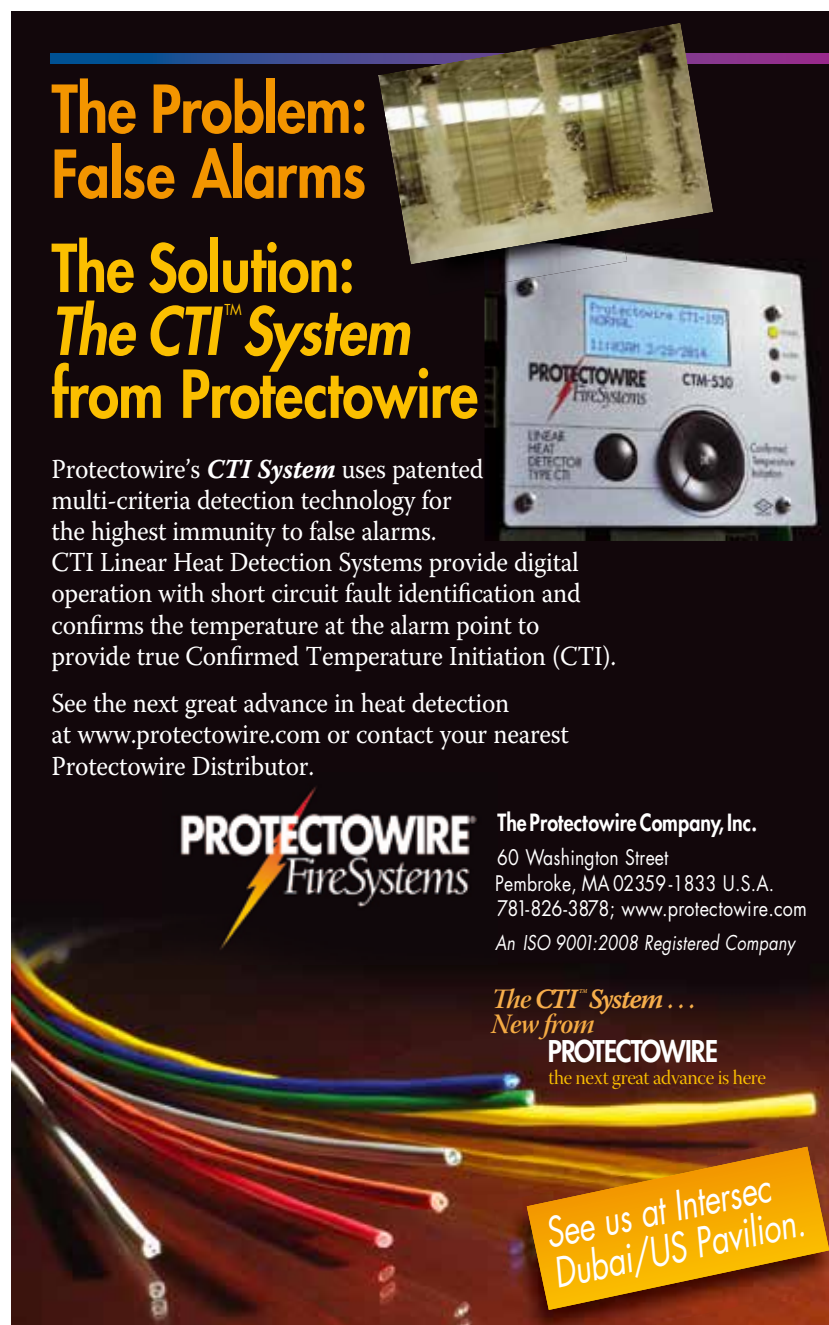
For more information, go to [www.gexcon.com](http://www.gexcon.com)

## 360 Online Support Portals

ADVANCED now offers all customers personalised online support portals that give its partners specific features depending on their status and role in the industry, whereby customers, partners and users get a lifetime portal that grows with them and follows them throughout their relationship with Advanced.

On signing up (which is free), users can: open and close support tickets; see their entire support history; book training and review their Advanced training history; download training certificates, the latest software (requires extra authorisation) and warranty certificates (with their company details) of installed panels for their own or customer use. Additionally, they can: request approved partner certificates; download manuals and technical documentation; request brochures and marketing support; and book product demonstrations.

For more information, go to [www.advancedco.com](http://www.advancedco.com)



**The Problem:  
False Alarms**

**The Solution:  
The CTI™ System  
from Protectowire**

Protectowire's **CTI System** uses patented multi-criteria detection technology for the highest immunity to false alarms. CTI Linear Heat Detection Systems provide digital operation with short circuit fault identification and confirms the temperature at the alarm point to provide true Confirmed Temperature Initiation (CTI).

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## Video Fire detection for Memorial Flight Hanger

The SigniFire video fire detection (VFD) system from FIKE SAFETY TECHNOLOGY has been deployed in the Battle of Britain Memorial Flight hangar at RAF Coningsby to protect some of the UK's most valuable historic assets.

Most notable among the WWII aircraft at the Memorial Flight hanger are the Spitfire, the Hurricane and one of only two flight-worthy Lancaster bombers in the world. It was therefore imperative that when the fire protection needs of the hangar were reviewed, a solution was chosen to provide effective and reliable fire detection.

The camera-based SigniFire VFD visually detects the presence of fire or smoke at its source. Multiple cameras were installed, covering both the floor of the hangar and the roof space to provide fast and reliable response, effective protection in demanding environments and the bonus of providing CCTV images for security purposes, if required. The video can aid incident response and can be recorded for post-incident analysis.

Unlike conventional fire detection systems, SigniFire does not use traditional forms of smoke, heat or flame detection. Instead, it works by automatically analysing video images at the point of detection in each video fire detector, looking for tell-tale characteristics that indicate the presence of smoke and/or flames. Distributing the video processing to within each fire detector camera delivers improved resilience and with the use of fire resistant cable allows the system to be BS 5839 certified.

Video is recorded on a NVR and monitored remotely on a touchscreen SpyderPanel. SigniFire is also connected to a newly installed addressable fire alarm system in the building.

**For more information, go to**  
**[www.fikesafetytech.co.uk](http://www.fikesafetytech.co.uk)**




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## Historic Tower Protection

A new fire safety system designed to protect one of most iconic coastal landmarks on the UK's Dorset coastline has KENTEC's fire safety control panel technology at its core. Clavell Tower, a unique four-storey circular tower was saved from the crumbling cliff edge in 2008 before being fully restored and converted into one of the most coveted holiday lets in the country.

The fire safety system is based around a Kentec Syncro 1 Loop fire control panel with a mix of Hyfire wireless system thermal detectors, wireless optical smoke detectors, and base sounder beacons, which avoided any disruption to the building's historic fabric or damage to the decorative interior through the use of unsightly cables.

**For more information, go to**  
**[www.kentec.co.uk](http://www.kentec.co.uk)**



## Water Mist Achieves VdS Type Approvals

MARIOFF has received a new VdS type approval for its Hi-Fog modular sprinkler pump unit (MSPU) and an extension of the existing VdS type approval for its Hi-Fog gas-driven pump unit (GPU) for the protection of enclosed turbines, machinery and special hazard machinery.

The new type approval for the MSPU

enables the protection of machinery with combustible and flammable liquid hazards, such as emergency generators and transformer rooms in buildings with volumes up to 1,375 cubic meters. The GPU type approval extends the protectable volume capability from 500 cubic metres to 1,375 cubic meters.

The improved GPU approval for gas turbines and machinery spaces enables the use of more flexible installation criteria, which takes the geometry of a combustion turbine into account.

**For more information, go to**  
**[www.marioff.com](http://www.marioff.com)**

## New Carbon Monoxide Sensor

EURO-GAS MANAGEMENT SERVICES has introduced ECO-Sure X, which it describes as: "a unique, high quality and low cost carbon monoxide sensor, specifically designed to meet the growing demand for CO detection". It comes with a ten-year warranty under normal operating conditions, is unaffected by high and low humidity, features a filter to eliminate false alarms caused by common household vapours, and is particularly suitable for fire detection systems, in addition to residential CO alarms and car park monitoring systems.

ECO-Sure X is designed to meet all the requirements of the latest LPC and VdS standards for fire detection using gas

sensors, in addition to BS7860, EN50291, UL2034 and CSA16.9. ECO-Sure X sensors are amperometric and therefore require no power for operation, ensuring suitability in even the largest distributed systems where power consumption is of paramount importance. Simple, low cost drive circuitry helps reduce design time and lower final product cost. The ECO-Sure X two-electrode CO sensor is available from Euro-Gas as a single electrochemical sensor or in combination with 4-20mA circuitry, thus providing an immediate, simple gas detection solution for original equipment manufacturers.

**For more information, go to**  
**[www.euro-gasman.com](http://www.euro-gasman.com)**





# New Temperature Initiation Linear Heat Detection

PROTECTOWIRE FIRESYSTEMS has announced the release of an advanced product line of linear heat detectors utilizing confirmed temperature initiation (CTI) sensing technology. This patented technology reaffirms the company's tradition of developing advanced and innovative fire detection products.

Utilizing the thermoelectric effect, the new detectors have been designed to generate a more accurate heat response and eliminate false alarms caused by mechanical damage. Patents have been issued in the United States and other overseas countries.

"We are truly proud of our engineering team for developing this new product based on our proven and reliable digital linear heat detection technology that has served the industry for over seventy-five years," said Gary Fields, Executive Vice President of The Protectowire Company, Inc. "This next generation of fire protection technology gives the marketplace better discrimination in detecting actual heat related to fire versus physical detector damage, which can be interpreted as a false alarm in conventional heat detectors."

The basis of CTI combines two proven and reliable technologies using the thermoelectric effect; a measurement technique that, in this application, delivers a confirmation of actual heat from combustion or fire. Most heat detectors in the industry today will erroneously interpret an electrical short caused by mechanical interference or damage as an alarm condition thereby triggering alarm sequences such as activating extinguishing systems. With CTI, any short circuit caused by mechanical damage to the detector from such things as a falling pallet inside a warehouse, would not signal a false alarm. It would be detected as a trouble or fault condition on the detection circuit.

With CTI a new approach has been

taken. Protectowire FireSystems has combined the thermoelectric effect with proven digital heat detector technology and a special interface module, into a new multi-criteria detection system. The smart interface module is able to interpret electrical changes caused by heat. Using advanced confirmation protocols, the module provides reliable digital detector operation with true short circuit fault identification.

Alarms are activated only when the temperature at the alarm point exceeds the established alarm threshold, thereby providing true confirmed temperature initiation. The result is a highly accurate and reliable fire detection system for high risk commercial and industrial applications.

"We have had many specifiers, distributors and end users asking us for more refined data and accuracy for a very long time," said John Whaling, Executive Vice President and Director of Sales. "We are happy to finally be able to deliver this advanced technology, especially in applications where a false alarm can trigger a sprinkler or foam system, causing damage or effecting production, costing the end user thousands or even millions of dollars. With short circuit fault discrimination and the ability to confirm the temperature at the alarm point, CTI is accurate and highly reliable."

**For more information, go to [www.protectowire.com](http://www.protectowire.com)**



Image courtesy of Protectowire

# New Beam Smoke Detector From Polon-Alfa

The DOP-6001R beam smoke detector from POLON-ALFA is designed for the detection of smoke in the early stage of fire growth. It is particularly suitable for the protection of large-area rooms where it would normally be necessary to use a substantial number of point smoke detectors.

The DOP-6001R detector analyses the mean value of smoke density and therefore is particularly for buildings with high ceilings or in situations where smoke can be scattered in a large area before it is detected. The beam detectors are particularly recommended for applications such as churches, cathedrals, historical buildings with aesthetically challenging ceilings, theatres, opera-houses, sports halls, manufacturing plants and other high-ceiling rooms in which point detectors would be ineffective.

The DOP-6001R detector is equipped with fire and fault-potential-free relay output for operation in fire detection systems of other manufacturers.

## Specific Features

- The transmitter and the receiver are placed in a single casing. An infrared radiation beam reflects from a special prismatic reflector, so it is not necessary to connect the transmitter and the receiver with cabling, as is the case with most detectors on the market that have
- the transmitter and receiver in separate casings and require cabling. Installation cost is decreased.
- A built-in laser pointer enables easy and accurate adjustment of the optical path of the detector. With conventional detectors this is labour intensive, particularly over distances.
- The special prismatic reflector has the additional feature of infrared beam concentration, directing it to the receiver.



Image courtesy of Polon-Alfa

This allows the installation of reflectors on walls and structures that are subject to small vibrations due to presence of heavy machines, as well as deformations as a result of large temperature changes.

- A processor detector with a self-adjusting supported memory analyses the protected area. A decision regarding the fire alarm condition is undertaken after three verifications of measured value and comparison with different models.
- The detector provides early warning to service personnel that the optical structure is soiled.
- Its virtually flat sensitivity is independent of the dimensions of smoke particles, which boosts the detector's versatility.
- The DOP-6001R protects large areas with a single beam detector.
- Sensitivity thresholds can be set depending on the distance between detector and reflector, and depending on environmental conditions.
- EN54 approval by LPCB approval is currently in progress.

## Technical Data

Operating voltage	From 9.5 to 28 V
Operating current (depending on control panel)	From 8 to 30 mA
Alarm current	From 20 to 100 mA
Current at break of light beam	< 0.3 mA
Service signal current	< 0.3 mA
Operation distance with E39-R8 reflector.	5 to 50 metres
Operation distance with set of reflectors 4 x E39-R8	50 to 100 metres
Sensitivity thresholds (at choice)	18%, 30%, 50%
Number of detectors in one conventional line	According to project
Load of fire and fault alarms relays contacts	1 A/30 V
Power supply of laser pointer (only during adjustment)	9 V 6F22 battery
Operating temperature range	-25 to +55 degrees C
Dimensions	129mm x 80mm x 84 mm

For more information, go to  
[www.polon-alfa.pl](http://www.polon-alfa.pl)



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# New Agent for Aircraft Ramp Protection

Extinguishing agents today have to meet many different requirements for aircraft protection. Fire extinguishing agents must be effective on fuel spill fires, engine fires, cause no 'collateral' damage to components not involved in the fire and finally, must be environmentally safe.

**N**FPA 407 Standard for Aircraft Fuel Servicing and NFPA 410 Standard on Aircraft Maintenance has requirements for wheeled extinguishers with a minimum capacity of 57kg of agent and a minimum UL rating of 80B:C.

First let us look at a brief history of fire extinguishing agents for use around aircraft. Since the start of aviation, the search for fire extinguishing agents that are suitable for use around aircraft has been extensive.

Just as aeroplane design and materials have changed greatly, so has the options for fire protection. Starting with water, water fog and then high pressure water mist, chemical foam and foam pellets were all used to have a greater effect on fuel spills involving aircraft. Carbon dioxide became a standby for ramp protection because of its effectiveness

on engine fires and its quality of leaving no residue. Chemical foam gave way to protein foam, fluoroprotein foam and then AFFF. Now environmentally-friendly fluorosurfactant-free foams are available for use around aircraft. Foams were found to be useful for spills, but did not answer the question of engine fires or fuel fires in more than two dimensions.

Dry chemical, originally sodium bicarbonate, was found to be effective on spill fires, engine fires and three dimensional fires. Purple-K (potassium bicarbonate) dry chemical took the forefront in the 1960's after being developed by the U.S. Naval Research Lab in the late 1950s because of its superior effect on flammable liquid fires, when compared with regular dry chemical. It still has the best "knock-down" on a spill fire compared with any other agent, but concerns regarding the powder residue, and detrimental effects on jet engines left many users looking for an alternative. ABC or multi-purpose dry chemical became available in the 1960s but since, has not been used around aircraft because of its corrosive nature to aircraft components.

Enter the Halons, specifically Halon 1211 (bromochlorodifluoromethane), a streaming or vaporising liquid agent that leaves no residue. Similar to dry chemical in its ability to be used on spill fires, three-dimensional fires and engine fires are still in use today using recycled agent. Its harmful effects on the environment, specifically, its ozone depletion potential (ODP) and its global warming potential (GWP) has caused the use of the agent to be curtailed or ceased all together. After the Montreal Protocol, substitutes for Halon firefighting agents were developed. These agent formulas looked to find something that

was effective on fire and yet did not have any, or very little, ODP. Many agents of both the streaming and non-streaming types were developed but none of them were as effective on Class B fires as Halon 1211 leaving some end users to hold out for a "drop-in" agent that would be just as effective, kilogram for kilogram as Halon 1211.

The Kyoto agreement turned the ecological impact concerns to global warming potential and atmospheric lifetime of any substitute agents in light of global climate change. Some of the substitute agents were found to have little or no ODP but had atmospheric lifetimes measuring in the thousands of years. All of this brought questions regarding the sustainability of some Halon replacement agents.

Now there is a new firefighting liquid agent, 3M™ Novec™ 1230. The agent is newly available in a UL Listed 3A:80B:C rated wheeled extinguisher using 68kg of 3M™ Novec™ 1230. This agent has an extremely low atmospheric lifetime – in the order of not years or even months, but days (approximately one to two weeks). Studies show that it has zero effect on the ozone layer or zero ODP. The GWP of 3M™ Novec™ 1230 is comparable with CO<sub>2</sub>, making a case for the agent's sustainability.

The newest option for meeting the wheeled unit requirements of NFPA 407 and NFPA 410 is now available with both firefighting effectiveness and environmental sustainability. Amerex Corp. is the first fire equipment manufacturer to provide this wheeled extinguisher containing 68kg of 3M™ Novec™ 1230, with a 3A:80B:C listing, readily available for aircraft ramp protection.

**For more information, go to  
[www.amerex-fire.com](http://www.amerex-fire.com)**



Image courtesy of Amerex



# Amerex Corporation

7595 Gadsden Hwy. Trussville, AL 35173 ♦ Ph: (205) 655-3271 ♦ Fax: 1-800-654-5980 ♦ e-mail: sales@amerex-fire.com

## Model 775 150 LB. 3M™ Novec™ 1230 WHEELED FIRE EXTINGUISHER



- Environmentally friendly  
3M™ Novec™ 1230 Clean Agent  
(0 ODP - 1 GWP)
- Brass, chrome plated operating valve
- 125 PSI Operating Pressure
- Heavy duty steel cylinder, carriage and hose hanger assembly
- Quick release 40 ft. discharge hose with brass/chrome plated ball type shut-off nozzle
- Pressure gauge protected by a stainless steel gauge guard
- Corrosion resistant lime/yellow polyurethane paint finish
- Large color coded mylar instruction labels
- Operating temperature range: -40° to +120° F.
- 6 year manufacturer's warranty

SPECIFICATIONS	150 LB. Novec™ 1230
Model Number	775
Agent	Novec™ 1230
UL Rating	3A:80B:C
Capacity (lbs.)	150
Shipping Weight (lbs.)	375 (filled)
Discharge Time (sec.)	22
Cylinder - DOT 4BW240	
Operating Press (psi)	125
Test Pressure (psi)	480
Burst Pressure (minimum - psi)	960
Discharge Range (ft.)	30
Hose Length (ft.)	40
Hose Diameter (in.)	1.0
Wheels (Semi-pneumatic) (in.)	16 x 4
Height (in.)	62
Width (in.)	29
Depth (in.) - Model 775 / 776	40 / 41

Model 776 available with 36" rubberized wheels

# Meeting the Warehouse Sprinkler Challenge

The protection challenges for storage commodities have increased with the storage of more plastic commodities, whether cartoned or uncartoned, expanded or unexpanded. Building heights have also increased, particularly with the use of high-bay storage using automated storage and retrieval systems.

The use of ceiling-only sprinklers has not been an effective method for suppression or control of rack storage fires when the ceiling height exceeds certain limits and/or the stored commodities are exposed or expanded plastics. This has concentrated the minds of the fire sprinkler community in search of effective solutions to this challenge.

The concept of using horizontal barriers and large K-factor extended coverage storage sprinklers as in-rack protection came from observations and early results of The Fire Protection Research Foundation's (FPRF) Exposed Expanded Group A Plastic Test Series. This research was conducted to look at ceiling-only sprinkler protection for rack storage of exposed expanded Group A plastics. Protection schemes for these applications have been outside the scope of the NFPA Standard 13, chapter 17 (see Figure 17.1.2.1 "Exposed Expanded Plastics"). FM Global Data Sheet 8-9 does provide design criteria for ceiling-only protection of exposed expanded plastics with ceiling heights up to 12.2 metres using a specific brand of sprinkler. However, the water demand is extremely high. The FPRF wanted to reduce the water demand and elected to test using vertical barriers on every other rack upright or approximately 4.9 metres apart.

After a series of several tests, the FPRF proposed a suggested design for NFPA Standard 13 using vertical barriers. The basics of the design: 12.2-metre ceiling height, 10.7-metre storage height, 2.45-metre aisle width, vertical barriers at 4.9 metres intervals, K-25.2 Pendent ESFR sprinklers installed at the ceiling, 4.1 bar minimum for each sprinkler, the flow to be calculated for a minimum of 12 sprinklers

operating and a hose stream allowance of 946 litres-a-minute for a 60 minute water supply duration.

However, because of water distribution tests that were being conducted on the performance of a K-25.2 extended coverage pendent storage sprinkler as an in-rack sprinkler, a decision was made to conduct a series of fire tests at UL using a horizontal barrier and/or multiple horizontal barriers and not the vertical barriers being used in the FPRF test series. It was postulated that the K-25.2 extended coverage pendent storage sprinkler would provide superior performance because of its extended coverage spray pattern, its ability to flow a large quantity of water at low pressure due to the 25.2 K-factor, and the fast responding characteristics of its low thermal mass solder releasing element.

Subsequent tests produced successful results on both exposed expanded and cartoned unexpanded plastic commodities for various storage and

building heights. Test results showed high levels of fire control with very few fire sprinklers opening during the tests resulting in lower overall water demand of the fire sprinkler system compared with current ceiling-only protection schemes. Additional tests have also shown this system as being effective in protection of multiple row racking arrangements, in the case of 1.2-metre narrow aisles and for storage of flammable liquids. The additional tests have also indicated the suitability of this system as an alternative to existing ceiling only protection schemes where water supply is a major issue.

The intent of these tests is to create a pool of data for design professionals to use in a "performance-based design" in order to protect commodities and arrangements beyond the current scope of the NFPA Standard 13 or other International standards.

**For more information, go to [www.reliablesprinkler.com](http://www.reliablesprinkler.com)**

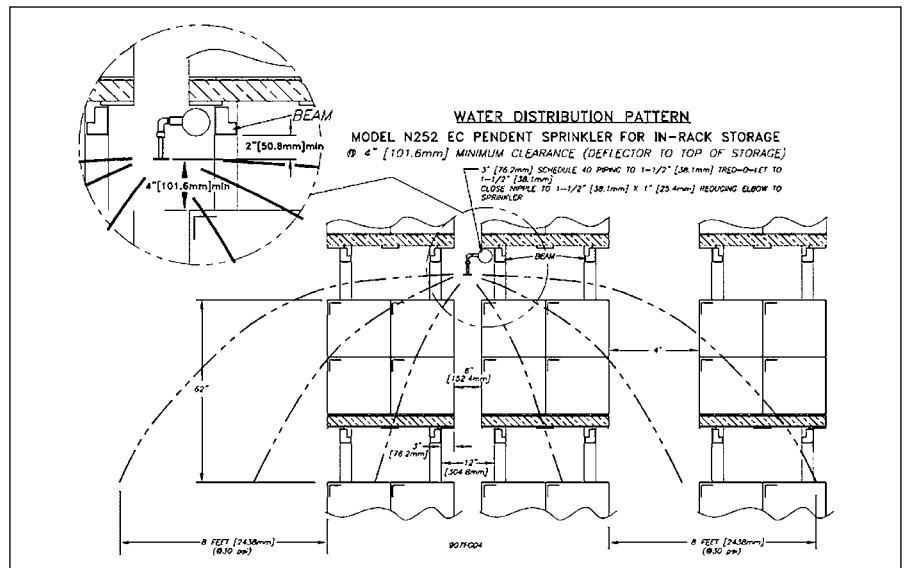


Image courtesy of Reliable



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## Storage Protection Revolution *Introducing* the Model N252 EC Pendent Sprinkler

- Protection of Exposed Plastic Commodities
- In Rack Sprinkler Protection with Horizontal Barriers Resulting in Fewer Sprinklers and Reduced Water Demand
- The N252EC In Rack System is the Solution for ASRS (Automatic Storage & Retrieval Systems)
- Enables the Protection of the Highest Storage Facilities with Reduced Cost when Compared to Conventional Systems
- Extended Coverage Sprinklers with a K-Factor of 360
- UL Listed and FM Approved



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# SAPPHIRE System on Show at Tyco's State-of-the-Art Facility

**T**YCO FIRE PROTECTION PRODUCTS was pleased to welcome a group of customers from Europe and South Africa to the company's Great Yarmouth production facility, where it produces its award-winning gaseous suppression solution, SAPPHIRE. The event enabled customers to gain a first-hand insight into the level of detail, care and attention that goes into ensuring that Tyco's clean agent systems are supplied to the market, meeting the highest possible quality standards.

The production line was designed, engineered, developed and installed by Tyco Fire Protection Products and takes place in the company's state-of-the-art automated facility. This significant recent investment ensures that customers receive a product that exceeds industry standards and expectations.

The filling of inert gas, SAPPHIRE and FM200 containers is a process that demands high levels of control, accuracy and integrity. When finished containers leave the factory, it is vital that they are of the highest quality, and filled and pressurised in strict accordance with national and international standards, such as EN15004, ISO 14520 and NFPA2001.

At each stage during the manufacturing process, the production technician must scan a barcode located on the container to verify each process. Any critical control issues identified

with the product or equipment during manufacture will prevent the container from moving on to the next production step in the sequence. In this situation, the containers are moved to a quarantine area. The barcode system captures data from over 100 process control points to ensure traceability and product conformance validation.

During the event in Great Yarmouth, guests were given a tour of the facility and container filling lines, after which the Tyco Fire Protection Products team explained the latest developments in its SAPPHIRE fire suppression system. Representatives from Global Product Management, EMEA Sales Leadership and Training Services spoke about the capabilities and applications of the SAPPHIRE system, which has now been extended to include a 42 bar variation, while 3M™ discussed the specific properties of Novec 1230. Zurich Risk Engineering also presented the views of the insurance industry on critical area fire protection.

SAPPHIRE is an innovative solution for effective fire suppression in a wide range of applications. It protects valuable data, expensive equipment and safeguards irreplaceable assets, such as works of art and archived materials. SAPPHIRE was the first commercially available, custom-engineered system to deliver 3M™ Novec 1230 fire protection fluid. A clear, non-conductive agent with negligible global warming potential and zero ozone depletion, Novec 1230 is safe for use in occupied areas. As a result, SAPPHIRE is a greener and more environmentally-friendly fire protection solution.

With an extensive installed base for over ten years, SAPPHIRE is a specialist solution that suppresses fires rapidly and offers safe protection of occupied areas. The system delivers a rapid knock-down extinguishment within ten seconds, which results in less damage to electronic or other sensitive equipment. This in turn facilitates a much shorter recovery period – a key consideration in facilities with high value assets.

Alan Elder, Director of Engineered systems, Tyco Fire Protection Products, comments: "The SAPPHIRE system delivers effective fire protection with a proven record in sensitive applications where the safeguarding of valuable assets and people safety are vital. Electronic systems often cannot be shut down in an emergency and clean-up of agents is very difficult in a high risk environment, so a robust and reliable fire suppression solution such as the SAPPHIRE system is essential. SAPPHIRE will provide further benefits for the protection of a variety of applications around the world."

"Programmes such as the Great Yarmouth event demonstrate Tyco's global expert capabilities in this area, as well as strengthen relationships with our distributors and customers, and enable us to thank them for their continued support and cooperation," adds Sarah McCullough, Global Product Marketing Manager – Engineered Systems, Tyco Fire Protection Products. "Our commitment to supporting customers through training sessions and sharing expertise means they gain a thorough understanding of the technical solutions available. This equips them with information about the latest technologies in gaseous fire suppression and the ability to handle different application enquiries and overcome market challenges".

The 42 bar SAPPHIRE system offers economical and space-saving benefits since selector valves are used to cover several areas from a central storage location. There is also the opportunity for reduced pipe sizes, facilitating reduced installation time and increasing overall cost-effectiveness. The system is LPCB and VdS approved, and fully meets EN12094 standards and the requirements of NFPA2001, ISO 14520 and EN 15004 to ensure the highest quality fire suppression performance in every application.

**For more information, go to  
[www.tfpemea.com](http://www.tfpemea.com)**



Image courtesy of Tyco Fire Protection Products

# Reasons to choose SAPPHIRE...



## ...#2 where safety is a top priority



SAPPHIRE systems are ideal for use in occupied areas. SAPPHIRE uses 3M™ Novec™ 1230 Fire Protection Fluid which is very low in acute and chronic toxicity. When compared to other fire suppression agents, Novec 1230 offers the greatest margin of safety for regular Class A hazards between the design concentration of the agent (4.5% - 5.3%) and the No Observable Adverse Effect Level (10%).

With its international standards and meeting the requirements of approval agencies globally this is why SAPPHIRE 25 / 42 bar systems are ideal for use in occupied areas.

To find out how HYGOOD fire suppression products can help protect your business visit **[www.tfpemea.com](http://www.tfpemea.com)**

Or contact your local sales representative, call: 0161 2594 000



# Firefighting with Water Motor-Driven Foam Pump System

A water motor-driven foam pump system is a mechanical way of dosing foam concentrate and other firefighting additives into the water, without the need of external power or pressure balance.

There are mainly two different fundamental solutions to how to mix the foam concentrate into water flow:

## ■ Systems Using Pressure Balance

Systems using this method are for ex. in-line inductor, balance pressure proportioner, bladder tank proportioner, and around-the-pump proportioner. These systems dose the foam concentrate mainly by achieving a pressure balance between water and foam concentrate.

## ■ Systems Measuring Water Flow vs Foam Flow. In this group there are mainly two systems:

**1** Systems using electronically controlled flow meters for water and foam concentrate in conjunction with a variable output foam pump control system.

**2** Systems using a mechanical solution with a water motor-driven foam pump. These systems consist of two volumetric parts, one water motor and one foam pump, connected to each other through a direct drive coupling. With this solution the water motor acts like a combined

flow meter/drive for the foam pump, so automatically achieving the correct ratio between water motor and foam pump, without any external flow meters, foam pumps or orifices.

The water motor in this type of system may either be a turbine or a positive displacement type motor. The difference between these two options is that, with a turbine as drive, the flow and pressure range will be limited as a turbine (and Pelton wheel) is only partly volumetric.

With a positive displacement (= fully volumetric) water motor it is possible to maintain the mathematical ratio between water motor and foam pump in a wider pressure and flow range. FIREMIKS is such a fully volumetric system.

FIREMIKS can be used anywhere between a water source (hydrant or main water pump) and any type of nozzle (monitor, spray pipe, foam chamber, sprinkler head, low- ex, medium-ex or high-ex.) It does not need a pressure tank; only connect it to an atmospheric foam tank, which may well be the container from the foam liquid supplier. Furthermore it does not need any external energy.

## Operating Principle

The water flow goes through the FIREMIKS water motor. This generates a circular rotor motion, transferred to the pump over the direct-drive coupling. The concentrate is pumped into the water motor outlet, where dosing occurs. (= Direct Injection Variable Pump Output Proportioning, NFPA 11)

Since the water motor and the pump are directly connected, the system is flow-proportional. Dosing is automatically adjusted from the amount of water that passes through the FIREMIKS. The water motor rotor has ten working wings, which gives an early and stable volumetric

function of the water motor. The narrow interior design, along with low friction vanes, reduces noise level and creates long lasting durability.

With FIREMIKS a fire brigade can lay out a system consisting of one FIREMIKS and for ex. Three, four or five nozzles working independently of each other, at different heights and lengths from main water pump.

FIREMIKS is offered in mainly three versions; fixed, mobile (both with gear foam pump) and sprinkler (with piston foam pump), High-pressure versions are available on request. Suitable markets are industry, fire brigades, sprinkler, offshore/shipping, forest firefighting. FIREMIKS is available in different flow sizes, from capacity 300 litres-a-minute to 12,000 litres-a-minute, and with dosing alternatives 0.5%, 1%, 2%, 3% and 6% as standard. Other options are available on request, including units with selectable dosing rates.

Due to its comparable low weight and compact design and no need of external energy, installation of a FIREMIKS is relatively easy. It can, if requested, be supplied with a dosing return valve enabling regular tests without consuming any foam liquids, an economical and environmental-friendly option. FIREMIKS meets applicable parts of NFPA 11 and NFPA 1901 and production is made according to European directive 2006/42/EC. Third-party inspection reports from DNV, Bureau Veritas are available.

Some reference examples are Pertamina, Indonesia, Oliver Tham Airport, South Africa, Jotun A/S, Norway, British Petroleum, Mozambique, Singapore Marin, Singapore, Nynas Petroleum AB, Sweden.

**For more information, go to  
[www.firemiks.com](http://www.firemiks.com)**

▼ FIREMIKS FM 4000-3-RP-F,  
Pertamina Oil and Gas, Indonesia.



Image courtesy of Firemiks

## THE USER-FRIENDLY FOAM DOSING SYSTEM

### EASY TO INSTALL

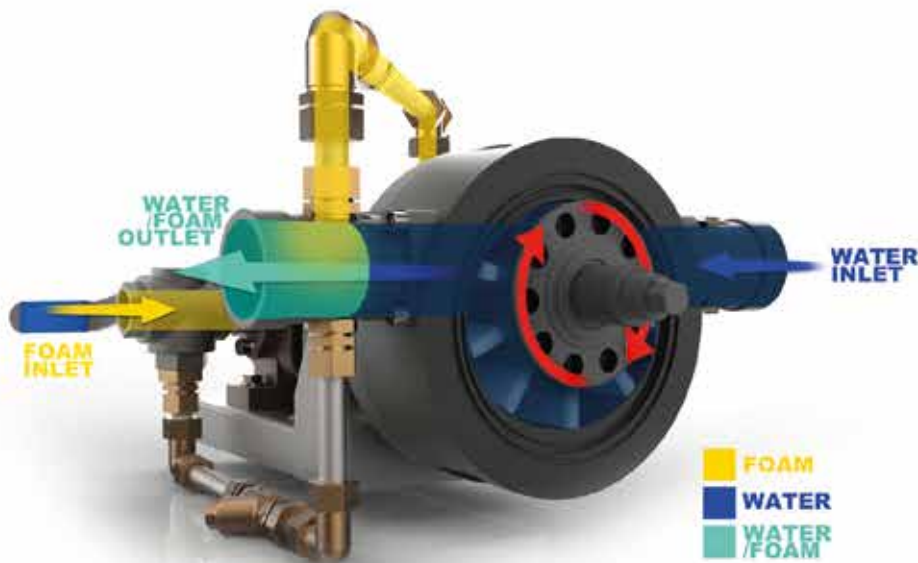
- Driven by water flow only, no external energy needed.

### EASY TO USE

- Self-regulating flow system, no need for pressure balance.

### ECONOMICAL

- Possible to test without consuming foam concentrate.



ISO 9001  
BUREAU VERITAS  
Certification



FIREMIKS FM 4000-3-RP-F - Pertamina Oil & Gas - Indonesia



Industry



Fire Brigade



Offshore/Shipping



Forest Firefighting



Foam Sprinkler



# A Wrap for a World of Passive Fire Protection Applications

Wherever high heat or potential fire is a problem, UNIFRAX FyreWrap® Fire Protection Products offer solutions to a variety of passive fire protection applications when lightweight, thin materials are needed to prevent flame penetration and achieve a significant temperature reduction.

FyreWrap products are used around the world to perform critical passive fire protection functions throughout the commercial building, transportation, and manufacturing industries. At Unifrax, we provide innovative passive fire protection solutions that make everyday life safer. We offer our FyreWrap product line as a premiere passive fire protection brand, providing proven life safety systems that meet international fire standards and local code requirements.

Some common FyreWrap fire protection applications include: fire-rated enclosures for kitchen exhaust and HVAC ductwork and marine bulkhead and deck insulation, through penetration fire-stops, construction joints, fire doors and seals, and electrical circuit protection systems. Applications all of which are tested, listed, and under follow-up service with leading internationally recognized certification bodies.



## Select Applications

The fire protection of ventilation and kitchen exhaust ductwork in commercial buildings is an important life and property safety measure. In the event of fire, unprotected ductwork has the potential to quickly spread fire to other rooms or floors. Proper passive fire protection most importantly saves lives, but may also prevent severe and extensive property damage. Over the past 20 years, FyreWrap Elite 1.5 has gained international recognition as a proven means of fire protection for duct applications that include, but are not limited to: kitchen exhaust, smoke control, stairwell and vestibule pressurisation, supply/return ducts, commercial dryer exhaust, as well as refuse and linen chutes.

Thousands of architects, engineers, contractors, and building owners have experienced the advantages, providing design flexibility and space and labour savings over existing materials. FyreWrap duct wrap products are sold in every major international market and have the most extensive certifications across the board to ASTM, ISO, EN, AS, and UL standards.

In the marine industry, vessels and offshore platforms require passive fire protection in critical areas for life safety and equipment protection. Bulkheads and decks are commonly insulated with fire resistant, high temperature insulation that complies with IMO Regulations. Unifrax offers specialised version of a low bio-persistence fibre blanket called FyreWrap Marine Blanket, specifically manufactured to meet these requirements. This material offers superb insulation value in a flexible lightweight non-combustible form. This offers builders and owners reduced structure weight, which may yield increased vessel speed, fuel savings, and available payloads.

Unifrax offers marine systems that:

- Are ABS, USCG, and Lloyds Certified for steel and aluminium structures.
- Comply with SOLAS safety objectives.

- Meet IMO FTP code fire test requirements, Res. A.754(18).
- Comply with Fire Resisting Division for High Speed Craft (HSC); Res. MSC.45 (65.)

Many industrial processes require quick, controlled shut down of critical equipment in an emergency to eliminate or minimise the threat of fire and explosion causing potential loss of life, equipment, and business operations. FyreWrap cable insulation provides an external insulation wrap around cables trays and conduits to provide a fire rated enclosure, permitting continued operation for a specified period of time. FyreWrap cable systems are FM Global approved and comply with many industry specifications on fireproofing for petroleum and petrochemical processing plants.

## About Unifrax

Unifrax is a global leader in high-performance specialty products used by many industries in a diverse group of applications. Unifrax employs over 2,500 people worldwide with 27 manufacturing facilities and various regional and sales locations in the United States, Europe, Asia, South Africa and Latin America.

Our purpose, mission and values are based on our commitment to produce high quality specialty products that help our worldwide customers save energy, reduce pollution, and improve fire safety. Our commitment to customer satisfaction continues the tradition of supplying quality products that meet our customers' application, while maintaining the strong spirit of innovation that has always been a hallmark of our business. This focus on providing innovative products and services continues to position us as a leader in our industry. Outstanding customer service and knowledgeable technical support continue to be the cornerstones of our success.

**For more information, go to**  
**[www.unifrax.com](http://www.unifrax.com)**



FyreWrap® DPS Insulation just opened the door to improved dryer duct fire protection.



Recent NFPA statistics indicate significant injuries, loss of life and property damage due to clothes dryer fires in residential buildings. At the same time, code requirements for dryer exhaust ductwork in multi-family residences have been difficult to achieve in real-world conditions – until now.

### Introducing new FyreWrap® DPS Insulation for dryer ducts and plenums.

FyreWrap® DPS Insulation is an innovative duct wrap that provides a safe and cost-effective means to achieve a 1-hour fire resistance-rated enclosure for routing dryer ductwork through rated wood construction. It utilizes a lightweight, high temperature, low bio persistence fiber blanket specifically designed, UL tested and classified for this

critical application. It also provides code compliant fire protection for combustible items such as plastic pipes in the plenum area. FyreWrap DPS Insulation features a ½", single layer design that is flexible and easy to cut, fabricate and wrap to fit tight spaces, providing time- and cost-savings on many projects.



More information on FyreWrap DPS and our complete line of FyreWrap products is available at [www.arcat.com](http://www.arcat.com) and [www.unifrax.com](http://www.unifrax.com) or by calling 716-768-6500.

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[www.unifrax.com](http://www.unifrax.com)



# Olympia Electronics Solves Emergency Luminaire Challenge

As is well known, all large buildings are required to be equipped with emergency luminaires for eventualities such as fires, power failures and natural disasters such as earthquakes and cyclones. Nowadays more and more often, people use central battery systems for emergency lighting installations, particularly in these larger buildings.

Central battery systems comprise a central panel that contains batteries, charger circuits and control circuits for safety lighting and emergency signage zones. Significantly, individual luminaires in these central battery systems do not contain batteries.

On one hand, the main advantages of central battery systems compared with simple emergency luminaire installations are many. They include:

- Central battery system batteries' lifetime is ten years. This is two-and-a-half times more than a simple emergency luminaire battery's lifetime, which is just four years.
- Unlike emergency luminaire batteries, central battery system batteries are located centrally in one place. As a result of this, central battery system's battery replacement labour costs are much lower.
- Undertaking routine scheduled checks of the emergency luminaires, or undertaking checks of the entire system takes place in one location, again reducing the maintenance labour costs.

On the other hand, until today the main disadvantage of central battery systems was seen as the substantial cost of equipment when compared with the simple emergency luminaires with their integral batteries.

However, the Olympia Electronics central battery system series comprises six models: four at 300W with four, eight, 12 or 16 zones, and two units at 600W with eight or 16 zones. Olympia Electronics GR-8500 series panels are connected to 230V AC, but they have 24V AC / DC output. They include two sealed-lead acid-type batteries – 12V / 33Ah or 12V / 55Ah with 90 minutes autonomy for 300W load or 600W load.

These panels are designed and manufactured to operate with low-power LED emergency luminaires, and the new Olympia Electronics S.A catalogue includes many LED emergency luminaires suitable for operation at 24V AC / DC for use on escape routes or other locations where emergency lighting or signage is called for.

Central battery systems panels in conjunction with these low-power emergency luminaires can provide quality and cost effective solutions in buildings that require between 80 and 200 emergency luminaires.

**For more information, go to**  
**[www.olympia-electronics.gr](http://www.olympia-electronics.gr)**





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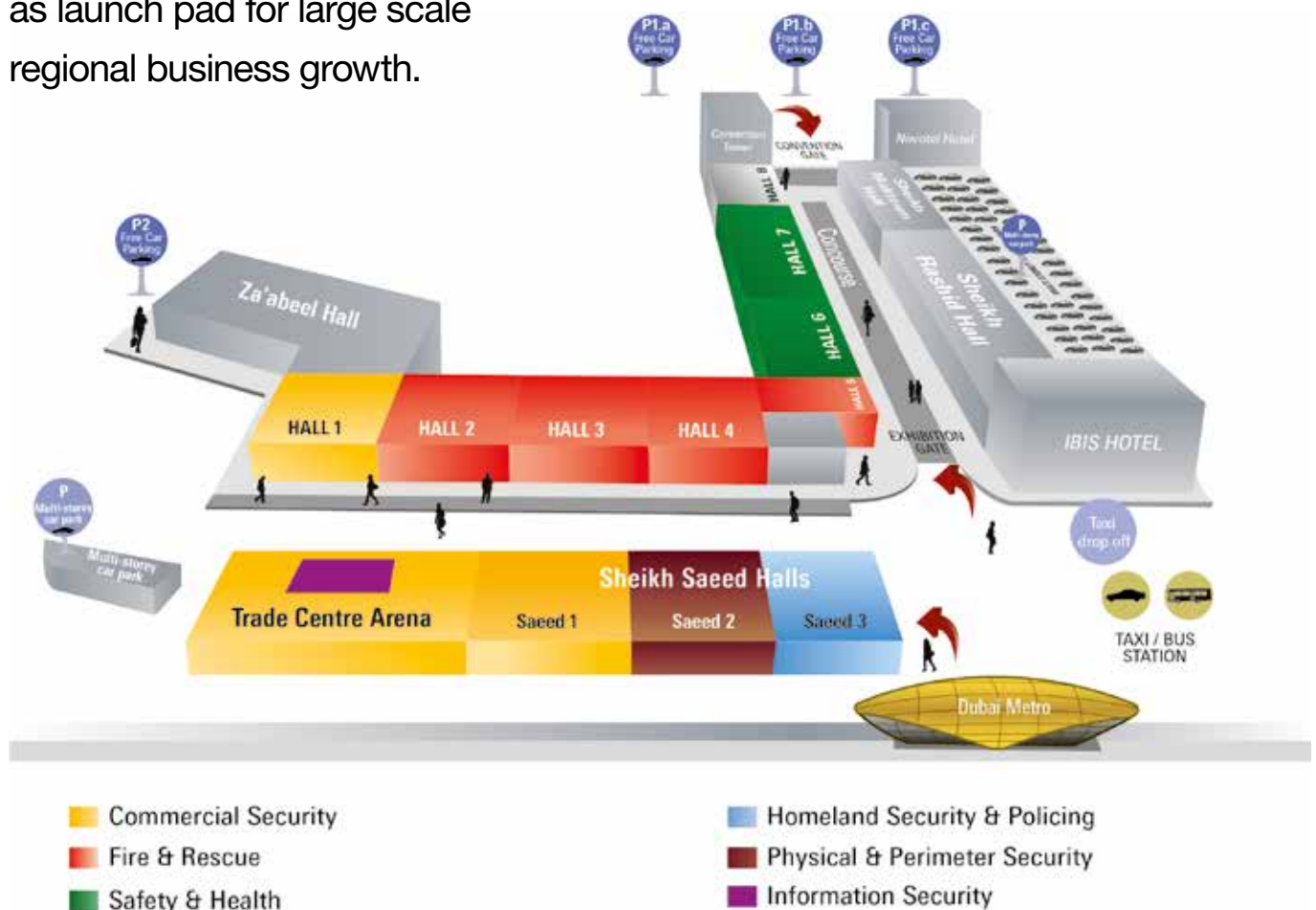


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# Intersec 2015 Profile & Showcase

Upcoming Dubai Expo 2020 Ignites Fresh Impetus in Regional Fire Suppression Market. More than 350 fire and rescue companies target Intersec 2015 as launch pad for large scale regional business growth.



The upcoming Dubai Expo 2020 has sparked fresh impetus in the Gulf fire suppression market, as authorities look to secure critical infrastructure and protect the millions of expected visitors to the showpiece event. The Middle East region's first ever Expo is expected to attract more than 25 million people from around the world, while a price tag of at least US\$9 billion suggests the host Emirate is pulling out all the stops to create state-of-the-art facilities and infrastructure.

The immense challenges that come with hosting such a major attraction mean

the Middle East is expected to be hotbed of innovation from international players in fire protection, with more than 350 getting ready to showcase their latest products and services at the 17th edition of Intersec in Dubai. Prominent companies exhibiting at the three-day event, which takes place from 18-20 January 2015 at the Dubai International Convention and Exhibition Centre, are targeting large-scale business growth and increased opportunities, as a result of the Expo 2020.

The fire and protection section has recorded the largest percentage growth year-on-year at Intersec, largely due to

UAE-based founding sponsor NAFFCO, which booked an entire hall for 2015. Other headline companies with a big presence include Honeywell, Hochiki, Eaton, Unisafe, UL, DuPont, Draeger, and Martech.

Hadi Al Khatib, CEO at Saudi-based SFFECO Global (Saudi Factory for Fire Equipment), and a regular exhibitor at Intersec, was among those confident that the growth in fire protection in the Gulf region will coincide with all other major industries. "The Dubai Expo 2020 is the confidence, or conformity, of growth in the region," said Al Khatib.





"If a country grows, then the people of the country grow, businesses grow, and there is growth everywhere. Of course safety and protection is a very vital part of this growth." He continued: "With the construction industry reaching for an upscale boom, it is very fair to say that the fire protection and safety industry will also be walking hand-in-hand with the overall boom. As the one-stop-shop for all firefighting and fire protection needs, SFFECO Global is prepared to cater and deliver products and services with cutting edge technology and high quality assurance for the growth resulting from the Expo 2020."

Organised by Epoc Messe Frankfurt,

Intersec is the world's largest trade fair for security, safety and fire protection. Long-time exhibitor and fortune 500 company, Oshkosh Corporation, will use the event to launch its Global Striker 6x6 Airport Fire Fighting Truck. Bassam Munem, Senior Regional Manager of International Sales at Oshkosh Corporation, said: "The overall impact of the Dubai Expo 2020 on both the fire protection market, and our business, is going to be very significant. We expect an increase in government spending on infrastructure projects which reflect positively on Oshkosh growth."

While many Intersec 2015 exhibitors anticipate an influx of new business opportunities as a result of the Expo 2020,

others are using the event to launch their latest product lines in a Middle East fire suppression market that, according to analysts Frost & Sullivan, will be worth US\$1.1 billion in 2016. These include British company Spectrex, which manufactures hazardous area flame and gas detection equipment.

"At Intersec 2015, we will launch a new line of open-path gas detectors that will be released Q1-Q2 2015 that will have open-path capabilities of detecting H2S or Ammonia," said Jay Cooley, Vice President of Sales for Spectrex. He continued: "It is a common expectation and exposure and investments as a result of the 2020 Expo will increase business and development for all industries in Dubai and through-out the Middle East. This is also true for the fire protection market."

Ahmed Pauwels, CEO of Epoc Messe Frankfurt, said: "Large-scale international events coming up in the region not only create demand for stringent safety, security, and fire protection measures, but also drive fresh waves of innovation from the leading providers as they adapt their products to the ever-changing needs of today. "As the largest international safety and security platform serving the wider region, Intersec provides international manufacturers and suppliers unmatched networking and business development opportunities."

The 17th edition of Intersec will feature more than 1,300 exhibitors from over 50 countries and includes 13 country pavilions from Germany, UK, USA, Canada, China, Hong Kong, India, Italy, Korea, Pakistan, Singapore, Taiwan, and the UAE. Intersec 2015 will feature an enhanced line-up of conferences, seminars and workshops covering fire safety; information security; commercial security; technical textiles and non-woven safety clothing; occupational safety and safety design in buildings. The three-day event is the largest and most international trade fair of Messe Frankfurt's global network of security and safety exhibitions, which include: Secutech India, Secutech in Taiwan, Secutech Thailand, Intersec Buenos Aires, Secutech Vietnam and Seguriexpo Buenos Aires.

**For more information, go to**  
**[www.safety-security.messefrankfurt.com](http://www.safety-security.messefrankfurt.com)**





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# 3M

## Nobel's Kitchen Fire Suppression on Show

NOBEL will be showing its K-Series kitchen fire suppression system that offers unrivalled commercial kitchen fire protection, covering all cooking appliances, extract canopy and ductwork while having the flexibility to extend throughout the ductwork to prevent fire spread to adjacent or adjoining areas. It is designed to integrate seamlessly into the kitchen environment and be practically invisible to both diners and restaurant operators.

The Nobel K-Series can be monitored, maintained, commissioned and fault-fixed remotely; reducing or negating input from site and in many cases the need for an engineer to attend. It has both LPS 1223 and Dubai Civil Defence approval and certification and can be seen at the Intersec Exhibition on Maxell International LLC's stand 4D24.

**For further information, go to**  
**[www.nobel-fire-systems.com](http://www.nobel-fire-systems.com)**



## NoFoam Expands Foam Testing

NOFOAM SYSTEM enables its customers to test any AFFF foam system without using foam concentrate, which saves money and removes the issues associated with clean-up and disposal of foam solution after testing.

This year, the NoFoam System expanded from ARFF trucks in airports, to now also test entire fixed pipe foam suppression systems in aircraft hangars. The test is performed without using any foam, and can save up to 95,000 litres or more of liquid foam solution per test. In parallel, the company is completing the development of an "alternative test liquid", which closely mimics the viscosity of the foam solution. Some facilities require the use of an alternative test liquid during testing, as part of the NoFoam flow based metering approach.

The NoFoam System is also suitable for larger industrial foam trucks, oil storage facilities and for any other fire protection system that primarily uses large amounts of foam concentrate to protect against a fuel fire.

**For further information, go to**  
**[www.nofaamsystem.com](http://www.nofaamsystem.com)**



## Honeywell Displays Closed-Loop Wireless System

HONEYWELL will be displaying its ConneXt Pack closed-loop wireless system with man-down alarm, which includes the wireless gas monitor QRAE 3 and EchoView Host and offers real time data monitoring from a range that can be extended to beyond a kilometre.

ConneXt Pack offers security and safety companies real time visibility of gas readings and alarm status of up to eight monitors. Incorporating RAE Systems by Honeywell's QRAE 3 portable gas detector, it provides what the company describes as: "an unrivalled gas detection wireless network". For use in multiple applications, the ConneXt Pack gives a typical range of 100 metres that is extendable to over one kilometre using Mesh Routers. The system provides a mobile wireless network of portable gas monitors to increase awareness, improve decision-making, and speed up incident response.

The EchoView Host can receive communications from up to eight monitors and display their call names, readings, and alarm status in real time on an easy-to-read screen. EchoView Host gives safety officers remote access to gas concentration data directly from the hot zone.

QRAE 3 is a versatile, rugged, one-to-four sensor pumped or diffusion gas monitor that provides continuous exposure monitoring of oxygen, combustibles, and toxic gases for workers and responders in hazardous environments. Its wireless communications capability enables access to real-time instrument readings and alarm status (including man-down alarm) from any location for better visibility and faster response.

**For further information, go to**  
**[www.honeywellanalytics.com](http://www.honeywellanalytics.com)**





AQUEOUS VERMICULITE DISPERSION

A NEW, REVOLUTIONARY  
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FOR FLAMMABLE METAL FIRES

## AQUEOUS VERMICULITE DISPERSION

### What is AVD?

AVD is an extinguishing agent designed for flammable metal fires such as magnesium and lithium battery fires.

It is an aqueous dispersion of chemically exfoliated Vermiculite manufactured by Dupré Minerals Ltd.



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**Minerals**

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Newcastle-under-Lyme,  
Staffordshire, ST5 9JE

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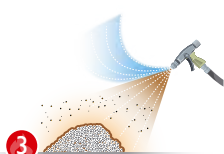
### How does AVD work?



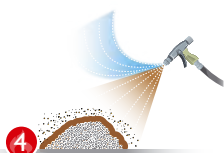
1  
Flammable metal fires such as magnesium, can burn at up to 3,000°C.



2  
AVD Mist is applied. The water content of AVD Mist cools the fire source.



3  
Vermiculite platelets build an oxygen barrier on the fuel source stopping the fire.



4  
Further AVD particles fall on top of the solidified crust, boiling off water further cooling the fuel source.



SEE US AT INTERSEC STAND F31

[www.AVDfire.com](http://www.AVDfire.com)



## Oil Technics Concentrate Offering

OIL TECHNICS FIRE FIGHTING PRODUCTS specialises in the supply and manufacture of firefighting foam concentrates and the laboratory testing of produced foam and foam concentrates. The company manufactures Aberdeen foam, a broad range of internationally accredited foam concentrates that are fully compliant to the C6 EPA 2010/15 PFOA Stewardship Programme and include AFFF, AFFF-LF and AR-AFFF concentrates tested to international standards including UL 162.

ISO 9001:2008 and ISO 14001:2004 accredited Oil Technics also offers a worldwide foam testing service and supplies foam testing kits and equipment to enable you to carry out your own testing as part of your firefighting foam maintenance programme.



For further information, go to  
[www.firefightingfoam.com](http://www.firefightingfoam.com)

## BIOex's Ecopol All-Risk Foam Concentrate

Ecopol, manufactured by BIOex, is a fluorine-free, alcohol resistant, high expansion foam that is effective on all types of fire (Class A and Class B) and is applicable on toxic vapours. However, its multi-application versatility does not prevent the high effectiveness of its extinguishing capability.

Launched in 2002, Ecoplo is formulated using a 100 percent natural surfactant base. The adhesive nature of the foam generated makes it possible for it to adhere to vertical surfaces for an extended period. It can be applied as a protective fire barrier to durably cool down plane fuselages or as a wide strip during a forest fire to make the vegetation fire proof and stop the progression of the fire.

Ecopol also generates exceptional high expansion foam and is recommended to drown large volumes, such as hangars, warehouses, ship's holds and car parks. Its affinity for solid supports, combined with its high wetting capability gives Ecopol high extinguishing performances on all Class A fires. The alcohol resistant property generates a protective gel film at the surface of all types of inflammable polar liquids and provides an exceptional resistance to re-ignition. Its extinguishing effectiveness on hydrocarbon fires can be compared to an AFFF foam concentrate containing fluorine. The mechanically insulating property of the foam generated is particularly effective, and can also be used to contain the toxic vapours of certain solvents that react to water.

For further information, go to  
[www.bio-ex.com](http://www.bio-ex.com)

## Detectortesters' New Multi-Sensor Test Tool

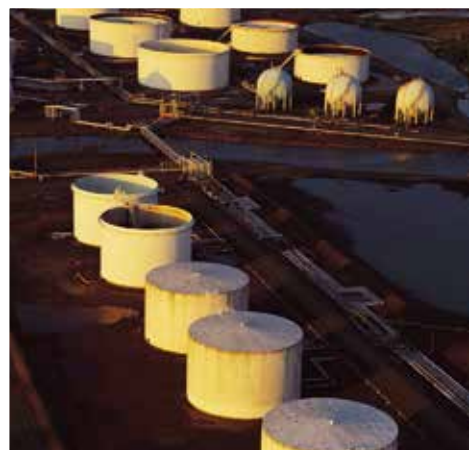
DETECTORTESTERS (No Climb Products) the designer and manufacturer of test equipment for fire detectors will be demonstrating its Testifire three-in-one test tool that is designed for advanced multi-sensor detectors, enabling the testing of smoke, heat and CO fire detectors with a single device.

Testifire can also be used on single sensor detectors that make up the greater percentage of existing detector installations. As well as contributing to increased productivity, Testifire provides a more environmentally friendly method of testing through the use new technology in the way in which it generates smoke, heat and CO. The company will also be featuring its Solo range of test and maintenance tools.

For further  
information, go to  
[www.detectortesters.com](http://www.detectortesters.com)







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## Firetrace Showcases Suppression Solutions

FIRETRACE INTERNATIONAL is showcasing its fire suppression solutions for industrial and commercial applications that include buses and commercial vehicles, electrical controls, engines and generator systems, hazardous storage and other enclosures. The company is also demonstrating its E4 system.

Firetrace's E4 recently achieved UL mark status by taking full advantage of the unique characteristics of 3M™ Novec 1230 Fire Protection Fluid. Suitable applications for this system include data centres, data processing and control rooms, oil and gas facilities, telecommunications, laboratories and plants, as well museums and historical archives housing priceless artefacts. Novec 1230 fluid leaves no residue and does not damage equipment or require any clean-up.

Firetrace pre-engineered systems provide cost-effective, stand-alone automatic fire suppression systems for your critical equipment, electrical/technical systems and other smaller enclosures (typically less than seven cubic meters). The key to the effectiveness of a genuine Firetrace system is the proprietary Firetrace detection tubing; a linear pneumatic heat sensor, which detects a growing fire in its early stages and allows systems to react quickly and effectively. This detection can be run through the smallest or most complex enclosures to ensure detection is always close at hand.

For further information, go to  
[www.firetrace.com](http://www.firetrace.com)



## TLX Actuator Meets New Supervision Requirements

TLX TECHNOLOGIES has unveiled an actuator for fire suppression systems with active installation supervision that is compliant with NFPA 2001, Sec. 4.3.4.1, which will be required on all clean agent fire extinguishing systems by 1st January 2016.

The new UL recognised component allows for fully engaged installation detection to be configured to exact requirements. According to TLX its rugged construction, ultra-fast response and the ability to be reset, ensures consistent performance over the solenoid's entire 15-year life span. In addition, TLX can adapt the supervision capabilities to a pneumatic actuator for slave cylinders.

For further information, go to  
[www.tlxtech.com](http://www.tlxtech.com)



## BRE's Global Certification

Independent third-party organisation BRE GLOBAL, based in the UK and with representative offices in China, India and Malaysia, will be showcasing its offering of certification of fire, security and sustainability products and services to an international market. LPCB (loss Prevention Certification Board) – accepted worldwide – is the certification brand used for fire and security products and services and its listings can be accessed, free of charge, at [www.redbooklive.com](http://www.redbooklive.com) or via apps from Apple, Google and Windows.

BRE Global carries out training, fire risk assessment, research and fire safety engineering and is also a Notified Body and Notified Test Laboratory for Construction Products Regulation, Pressure Equipment Directive, Marine Equipment Directive and Transport Pressure Equipment Directive.

BRE will be having two stands at Intersec. The fire-related stand is 3H32.

For further information, go to  
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# The Sustainable Construction Revolution

Creating more resilient buildings is a watchword in the construction industry. Organisations including the influential Rockefeller Foundation are taking a lead in the debate around how we create cities for the future that can cope with climate change and consume less energy.



**Birgitte Messerschmidt**  
Public Affairs Manager  
(Fire Safety) at Rockwool  
International.

Urban administrations have also started to take practical steps to re-define how buildings are developed. New York has incorporated resilience into its building codes and 100 cities globally have been awarded grants by the Rockefeller Foundation to hire chief resilient officers to lead the global push to create stronger, more energy efficient and better buildings. The resilience movement is far more than just an academic debate.

However, while improving environmental protection and creating sustainable buildings has been a core focus for the resilience movement, fire protection has tended not to be seen as such a critical part of this approach. This now needs to change. The new building methods being adopted to create more energy efficient, warmer and environmentally friendly homes could also be storing up new fire risks and structural weaknesses that we cannot ignore. So to

ensure buildings are resilient a 'life-cycle' approach to building design is needed, protecting against a wide range of threats, of which climate change risks such as flooding and extreme weather are not the only problem.

Creating low carbon homes often leads to the use of new materials and new construction methods – and the building regulations have to keep up. If they do not then that puts firefighters, building occupants and construction teams at increased risk in the event of a blaze.

Buildings being created today use lighter weight construction methods and materials that cut heat loss and improve energy efficiency but can also significantly change the dynamics of how buildings contain and spread fire, and also affect the structural strength the building offers in the event of a blaze or other damage. While the light-weighting and use of new construction methods



Image courtesy of Rockwool International

Image courtesy of Rockwool International



is necessary to create more sustainable and carbon-neutral buildings, we are at the edge of a new construction frontier, and it is one where the rules have yet to catch up with the reality of the new building environment.

That should be something that profoundly worries legislators and the building industry and we need to act now before we create a new generation of structurally risky buildings.

Currently, the regulation of construction methods and building design across Europe varies enormously. While the EU is setting clear guidelines for energy output and consumption in buildings (including Carbon Reduction 20:20:20 and Roadmap 2050 targets), it has yet to give a similar lead on how buildings should be designed and the construction standards maintained to create resilient buildings when using these new materials and methods. Yet the reality is the goals of creating more sustainable buildings and improving building standards are interdependent. Ultimately the most sustainable buildings are those that last.

In the past, buildings were typically constructed of brick and stone. Solid, heavy materials that are not flammable and which tend to retain much of their structural integrity even in the event of a catastrophic event like a fire. However, today modern buildings are frequently created using a light framework and insulation products. Often the framework is created using wood, one of the oldest and most widely used construction materials. These frames are then filled with insulation and clad with rendered insulation panels. This creates very energy efficient and relatively

lightweight constructions that retain heat in the building and cut domestic fuel bills and consumption.

Yet in many structures the internal and external insulation materials used can help accelerate and spread fire, and only certain types of insulation materials will prevent flames spreading. If the materials that form the structure, walls and roof of the building are not able to protect it adequately, the structural strength in the building can quickly dissipate, creating huge risk to residents and firefighters, and reducing the window of opportunity that people have to escape.

It is not just insulation used internally in buildings that can cause problems. In order to improve energy efficiency and reduce weight and materials used in the structure, external insulation cladding is increasingly being used in place of brick and stone facades to create a water resistant and energy efficient 'skin'. However these materials too must not participate in the fire or they can spread flames up the outside of the structure rather than containing it in a localised area.

Another facet of the scale of the problem is highlighted by investigations undertaken by the Underwriters Laboratory. These showed that a living room configured in the style of the 1950s would, in the event of a fire, take almost 30 minutes to develop into a fully-fledged blaze. The same room furnished with modern furniture would take less than five minutes.

It is not just the risk of fire spreading that has to be guarded against. The UK fire Statistics from 2011-2012 highlight that smoke plays a key role in 53 percent of fire fatalities and is the prime cause of death in more than a third of all fire

deaths (34 percent). So fire safety is about more than just the structural strength of the materials, their propensity to ignite and how they react in the event of fire. It is also about the way these new materials burn and the toxic smoke they emit when they do.

To show the importance of taking a joined up approach to fire protection in buildings Rockwool sponsored, in June 2014, a fire demonstration in Barcelona testing different types of insulation materials (including external wall cladding systems, sandwich panels and directly exposed insulation). The results of the tests were spectacular and demonstrated the significant difference in burning behaviour between different insulation products, both when directly exposed to flames and when tested as part of assembled systems.

Building design and material specification across the EU needs to be looked at afresh in light of the emergence of new construction methods to ensure that buildings continue to offer better fire performance than they did in the past, not less.

Equally, as other cities follow the lead of New York and incorporate resilience into building codes, and as more cities join programmes such as the Rockefeller Foundation 100 Resilient Cities Challenge, making building safer, as well as stronger and more energy efficient needs to be given greater prominence. According to the UN, by 2050 three-quarters of the global population is expected to be living in urban areas. That may seem a vision for the future but in reality many buildings being developed today will still be in use in 2050, particularly if they are to meet new sustainability and resilience criteria.

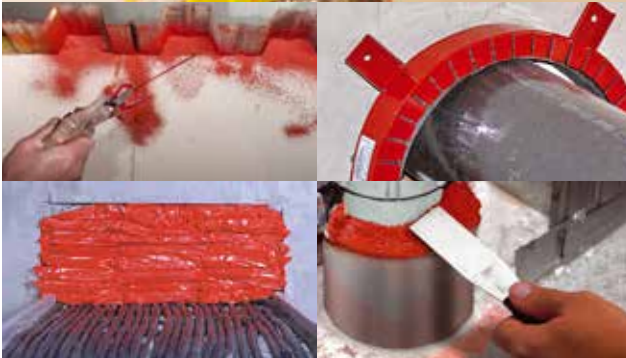
Setting higher standards for fire safety that reflect the reality of new construction methods is critical as we move towards a more densely populated urban environment. We are at a new frontier for building design. It is one that offers huge opportunities but it also brings risk. Maintaining and improving fire protection is too important to leave to chance – building standards and planning laws have to adapt to keep pace with new ways of building.

**For more information, go to  
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An increasing number of countries are demanding local construction projects be designed and built to meet the International Building Code (IBC). With more projects and industries being designed internationally to meet the high standards of IBC, firestopping has become a global issue. Metacaulk's full line of firestopping products comply with the IBC family of codes and are designed to offer economical solutions for all firestop applications from light commercial to the mega-projects. All Metacaulk products are superior in quality offering a guarantee on product performance for the life of the building.

# Stopping Fire in Its Tracks – Part Two

In the previous edition of *International Fire Protection* we took a look at a number of key firestopping considerations, including testing and fire rating. In Part Two of this article we are looking at the code requirements for firestopping and consider their implications for installers, discuss the required protection when fire-resistant assemblies are penetrated, and learn more about smoke barriers.



**Riley Archer**

National Technical Manager  
for Rectorseal

## Code Requirements

Requirements for firestopping in building codes date to before the development of the International Building Code (IBC), which most states and local authorities in the USA follow today. Although the IBC has gone through significant changes since its advent and not all types of construction require firestopping or fire-rated assemblies, one item that has stayed constant is that firestopping is required if a fire resistance-rated assembly is penetrated.

IBC Chapter 7 (*Fire and Smoke Protection Features*) outlines the requirements for fire resistance-rated assemblies and passive fire protection, including firestopping for the various construction types. The sections in Chapter 7 provide detailed information

on the minimum requirements for fire and smoke protection.

It is important to note that the IBC varies in content and requirements from version to version. The International Code Council, which develops the IBC, currently maintains a code-development cycle of three years. Because of the gap between code development and jurisdictional code adoption, the requirements will vary from state to state. Although the 2009 IBC is now available, some states are still using the 2003 or 2006 versions.

The 2009 International Building Code provides requirements for firestopping in Sections 713 and 714, but in previous versions firestop was located in Sections 712 and 713. Protection of penetrations of horizontal assemblies and fire resistance-rated wall assemblies are described



Image courtesy of Rectorseal





for passive life safety and property protection. The building codes are effective only when properly followed and enforced. No one wishes to be trapped in a building that was not fire-stopped to code when it catches on fire. Maintaining minimum safety standards are what the building codes do for all of us.

### **Firestop Applications.**

Now that you know that the code requires a firestop to be installed and that the system needs to be tested to ensure that it performs as required, what is the next step?

Installation is the final chapter for firestopping. Once installed, the firestop material must stay in place until it is needed to perform its function. Providing passive fire protection and life safety is possible only if the firestop material is installed correctly. Remember that the material itself has no real rating—only the tested system provides safety. For instance, a plumbing contractor who is installing supply and wastewater systems on a project will make holes through fire-resistance rated assemblies, run the necessary piping through the penetration, and then close the hole with the appropriate firestop system. This process involves understanding what the building code requires, knowing the rating of the assembly, and selecting the appropriate tested and listed firestop system to install in conjunction with the correct material required by that system.

Although in many cases firestopping systems are installed by the contractor that is performing the actual work, it is possible for many different types of contractors to install firestop. It is fairly common for general contractors to take on the responsibility for installing the firestop, and sometimes projects require all of the firestop to be installed by a single contractor or even by a specialty contractor whose primary business is firestop installation.

The contractors installing firestop must select products that are appropriate to their specific applications. Many different types of firestopping materials and products are available on the market today. Understanding that no universal product

in Section 713. Chapter 7 Section 714 governs joints installed in or between fire resistance-rated assemblies and requires an approved fire resistance-rated system to be installed. The code requirements for firestop and smoke stop installation provide protection of the structure, and these standards also help maintain a minimum degree of protection for occupants who live or work in a structure and for fire safety personnel who are required to enter the building if a fire occurs.

### **Penetrations**

A closer look at Section 713 shows exactly what is required for protection when fire-resistant assemblies are penetrated. Section 713.3.1.2 states that through-penetrations shall be installed and protected with an approved firestop system tested to ASTM E814 or UL 1479. The section also states that the fire-resistance rating of the firestop system (F rating) must be at least equal to the fire-resistance rating of the assembly penetrated. In Section 713.4.1.1.2, the code goes further to state that through-penetrations of fire resistance-rated floors must have F and T ratings of at least one hour, but not less than the fire-resistance rating of the floor penetrated.

The code does contain an exception for the T rating if the penetrating item is concealed in the cavity of a wall. However, when selecting systems for floor penetrations, it is necessary to find an approved firestop system that satisfies the F rating as well as the T rating when both are required.

### **Smoke Barriers**

Section 710 in the 2009 IBC explains the protection requirements for smoke barriers in construction. It seems simple enough that a smoke barrier just needs to stop the smoke, correct?

Unfortunately life is never that simple and neither is the building code. Smoke barriers are required to restrict the movement of smoke by definition, but when you look more closely you will see that Section 710.3 requires smoke barriers to also maintain a one-hour fire-resistance rating. Thus, if the smoke barrier assemblies must have a minimum one-hour fire-resistance rating and must stop the movement of smoke, then what are the requirements for penetrations?

All penetrations through smoke barrier assemblies must comply with Section 713, which, as mentioned, governs all firestopping for penetrations in the IBC. All penetrations in smoke barriers must be fire-stopped, but they also must stop smoke, which means they need to have an L rating. Section 713.5 states that penetrations of smoke barriers must be tested to UL 1479 air-leakage testing and maintain an L rating of no more than 0.14 cubic metres a minute per 0.09 square metre or 1.42 cubic metres a minute per any 9.29 square metres.

Understanding the specific requirements for construction that are prescribed in the building code is an elemental part of the construction process. Codes dictating passive fire protection ensure a minimum standard

Image courtesy of Rectorseal



will solve every firestop application is the first step to selecting the right product for an application. This will depend on the third-party-tested system used, but some fairly general statements can be made about firestop materials and their appropriate uses. However, keep in mind that every tested system is manufacturer or product specific. One product cannot be interchanged with another firestop manufacturer's material.

### Intumescent Materials.

A fundamental concept to understand about firestop products is intumescent materials. Intumescent refers to a material that expands when exposed to sufficient heat. A good way to describe this action is to consider black snake fireworks. When ignited, black snakes continuously create ashes that look like snakes due to intumescent reaction.

Intumescent firestop materials are one of the primary groups of products utilised in applications where one of the components in the assembly will deteriorate or burn away during fire exposure. The intumescent activity of the firestop closes the void that is created when the item melts or burns away, thus maintaining the integrity of the rated assembly. Intumescent firestop materials can come in many forms, from caulks to metallic collars with intumescent strip linings, with each product being designed for a specific purpose.

### Sealants

Simple mastics or sealants commonly are used to seal penetration firestopping as well as construction joint firestop applications. These sealants are available in various forms and chemical formulations, but the one thing they all have in common is that their performance is solely dependent on the system in which they are tested.

Firestop sealants in caulk, self-levelling, and spray grade are readily available in silicone, latex, and solvent-based products. They often require the addition of a backing material in the system to support the sealant. Sealants are probably the most recognised group of firestop products as firestop caulk is common to most construction projects because of its numerous applications.

### Firestop Devices

Another common product group used is firestop devices. Firestop devices range from simple collars to more complex sleeves and cast-in-place devices that are stand-alone firestop products.

A firestop collar or pipe collar usually consists of a metallic ring with an intumescent strip applied to the interior circumference of the metal housing. The collar is placed around a penetrating item, usually a non-metallic pipe, and permanently affixed to the fire-rated assembly. Firestop intumescent sleeves are metallic sheets with intumescent material adhered to one side. These sleeves can be placed around penetrating items and inserted into the wall to provide passive fire protection. One of the benefits of this type of device is that it allows for protection where collars cannot, such as when a penetration is at an angel.

A cast-in-place firestop device usually has a plastic outer housing similar to a concrete sleeve with the addition of intumescent material affixed to the interior of the sleeve. These devices are attached to the form decking of poured-in-place concrete structures prior to the concrete floor being poured. The devices are cast into the concrete to create the necessary hole through the concrete floor for the penetrating item and have the firestop built in. Many more types of firestop products are available than those described in this article. I have found that the best place to find in-depth information about products

is the firestop manufacturers' websites. These websites have detailed information about products, testing requirements, systems, and specifications.

### Conclusion

There are numerous types of firestop products and even more firestop applications in the ever-changing world of commercial construction. It is exceedingly important to remember that passive fire protection is a process in which identifying key features of the application helps match the right system and product with the firestop need. Everything in passive fire protection is system dependent and must reference tested passive fire protection systems and listed fire protection products.

One of the key points is that firestop products have no rating by themselves. The hourly rating of a tube of firestop caulk is zero, and the only way it has validity as a firestop product is when it is installed exactly as it was tested in a system. Testing standards are dictated by the building code and specific to the firestop application. The building code dictates the minimum standards to follow for passive fire protection and is the law that must be followed. When you utilise tested applications and maintain correct installation of the firestop product, you ensure life safety for the people occupying the building.

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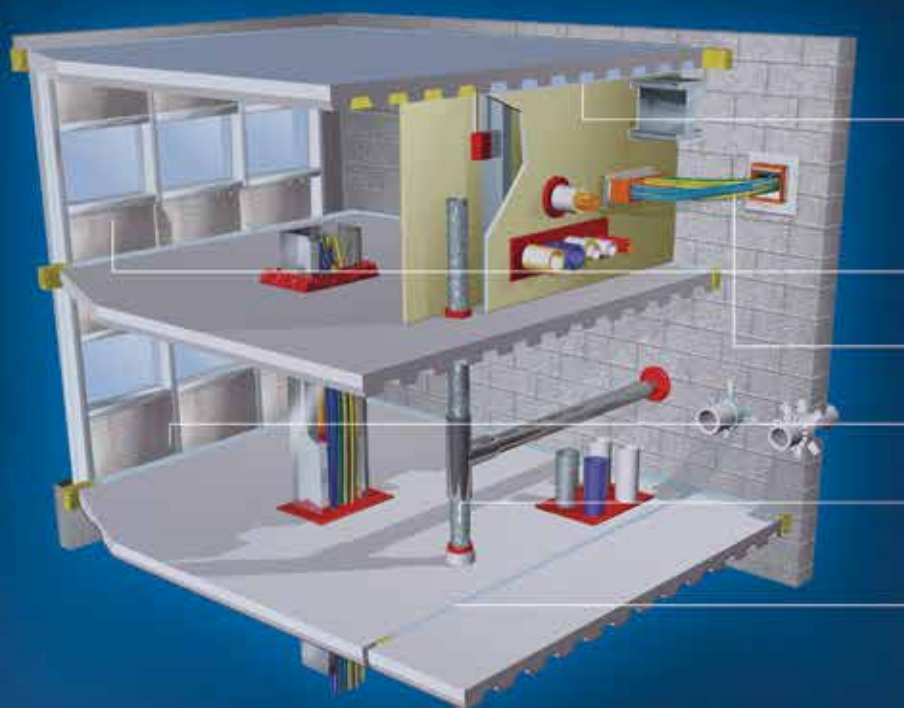
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# Facing a Problem with Façades

Scarcely a month goes by without another report on the Internet, in the newspapers, or on television about a façade fire somewhere in the world. In most cases the fires are non-fatal but lead to the substantial damage of the exterior envelope of the building and often spread to the interior as well.



**Niall Rowan**  
ASFP Technical Officer

In places, such as Dubai, where there have been a large number of recently-built high-rise buildings, the problems associated with façades – particularly new types of façades – are prominent and increasing. These fires can also claim lives, as has happened in Shanghai in 2010 and Roubaix in Northern France in 2012. So why is it that we are seeing more and more fires in façades?

## The Façade Problem

The problem with fires in façades is that there are many different ways in which fire can develop either inside or outside or through components of a façade.

Fires can result from radiation and 'flaming brands' from nearby buildings, fire outside the building (often deliberately set) or emanating from a room fire inside the building and breaking out, usually via windows. Of these, the fire emanating from inside the room is usually the most severe because it is the largest fire load (the contents of a room) and it usually involves a fully developed room fire.

Once the fire has started, it can spread up through the building in a variety of ways depending on the construction of the building:

- External fires can simply spread up the side of the building if the external cladding is combustible. There are regulations at national level that control the flammability of external cladding of buildings. However, in the absence of totally non-combustible claddings there is always a possibility that radiation or other heat sources outside the building will lead to fire spread upwards.
- Fire can break out of the building via the windows and because, in this situation, the fire source is normally a fully developed fire, the fire plume is likely to be large and intense. This means that there is a significant heat source outside the glazing on the next floor up and this can lead to the glass on that floor breaking and the fire going back inside the building. This then becomes another fully developed fire that then breaks out

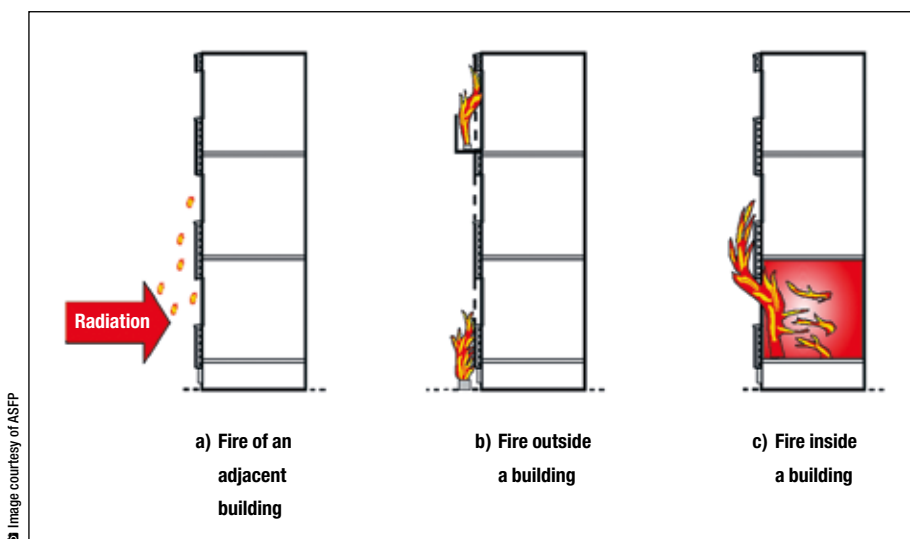


Image courtesy of ASFP

and jumps again to the next floor up the building where the cycle is repeated.

- In buildings with curtain walling constructions, fire spread can be inside the building but can spread upwards because of a lack of or inadequate fire seal at the perimeter floor slab.
- Fire can also spread up behind the cladding, for example, in rain screen cladding, particularly if combustible insulation is included. This situation is sometimes allowed because, although there are regulations controlling the flammability of the outside surface, that outside surface may be the cladding; the regulations may not control the insulation behind it that may be very flammable. The chimney effect within a rain screen will also exacerbate fire growth.

But what is causing the increased frequency of façade fires? The methods of fire spread listed above have been present in buildings for over 60 years.

The answer is that in the global quest to reduce carbon dioxide emissions, buildings are now insulated more than

ever before and the cheapest and best materials from a thermal insulation perspective are combustible polymeric materials. Such materials include, in increasing order of fire performance: expanded polystyrene, polyurethane, polyisocyanurate and phenolic. In addition, other building methods involving timber frames and structural insulated panels (SIPs) often contain combustible insulation materials, voids and are susceptible to poor installation – all features that make them more vulnerable to a fire starting and less robust in any fire that results.

### The Solutions

If we consider the current codes and regulations pertaining to the fire performance of buildings, they relate to a number of well-recognised scenarios. If we look at the 'reaction to fire' of materials that comprise the wall and ceiling linings, there are a number of fire properties that we can evaluate from ignitability through spread of flame, rate of heat release, production of smoke and flaming droplets, right through to combustibility.

In Europe, materials are tested for reaction to fire to establish the Euroclass to which they belong. These are based on what is called the 'small room scenario', where a fire initiated in a small room involves a single burning item, such as a chair or waste-paper bin, which then involves the wall and ceiling linings. The point about this scenario is not that it is necessarily perfect, or covers all or even a majority of situations, but it is a standardised situation that is well-recognised throughout Europe and the world.

Similarly, national codes and regulations define fire resistance requirements. These evaluate the building's ability to stay up and the time for which fire separating walls and floors can 'resist fire'. Again, a standardised scenario is used. This 'post-flashover' scenario assumes that all the contents of the room are on fire and that, consequently, there is a rapid and sustained increase in temperature that is maintained until either lack of ventilation, lack of fuel or suppression dictates decay.

In the fire tests used to model this,



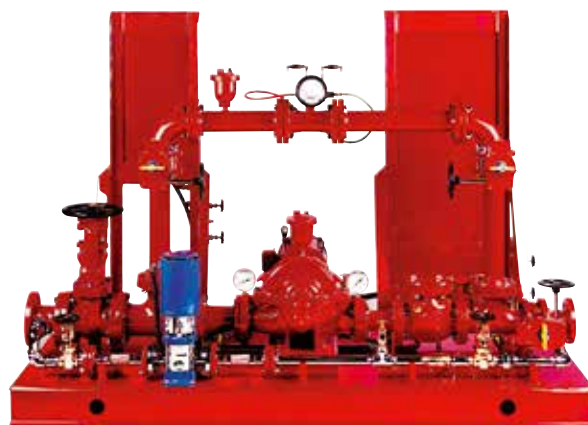
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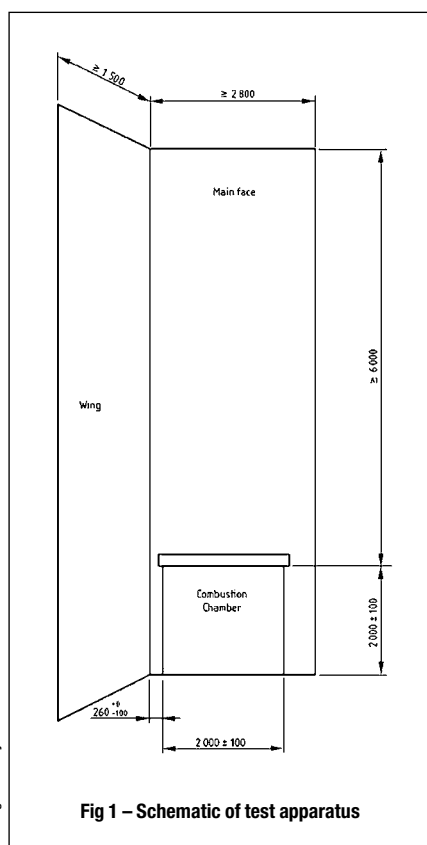
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These 'real fire' fire tests include:

- UK – BS 8414 parts 1 and 2 which are currently being revised (see fig 1).
- Sweden – SP fire 105.
- Germany – DIN 4120 part 20.
- ISO 13785 part 1 & 2.

All of these are a substantial improvement over trying to use existing 'reaction to fire' and 'fire resistance' tests. However, the problem is there is no European or globalised common scenario. They are all slightly different and compete. While this situation continues there is unlikely to be as much uptake as if there was one test for all. Standardisation always brings an increase in usage.

### Proposed New European Test

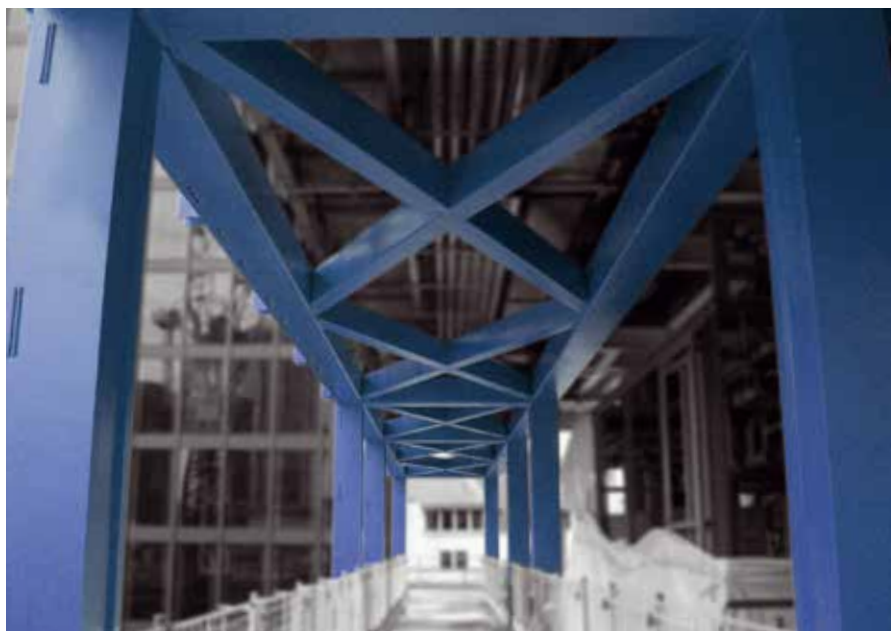
In support of the Construction Products Directive in Europe, a suitable test method to evaluate the fire performance of external wall cladding was developed by the European Organisation for Technical Approvals (EOTA). This would enable EOTA to grant European Technical Approvals to support manufacturers' products in the European market and increase and promote a standardised method of evaluation. Representation came from test labs across Europe and regulatory responses came from those countries which regulate façades including UK, France, Sweden, Poland, Hungary, Austria and Germany.

It was recognised that any test should

the rapid and sustained temperature rise is provided by specially designed furnaces that are operated to a standard time temperature curve (ISO 834). The ability of the element of building construction (beam, column, floor, wall, window, door etc.) to resist fire is evaluated in terms of its ability to maintain stability against any applied load, prevent the transmission of flames and hot gases and provide insulation.

But façades are not simply two dimensional lining materials, or beams, or fire resisting walls existing in isolation. They are large, sometimes complicated entities and consequently the scenarios that relate to reaction to fire and fire resistance are not really applicable. There needs to be a new consideration and understanding of the fire performance of façades.

Across Europe there are a number of national fire tests that attempt to model fire spread in façades. Most of these comprise two 'wings' several metres high, fitted with the appropriate façade or cladding system. A fire source, usually a timber crib, is placed near the base in an opening or adjacent chamber. The crib is lit and observations made of fire spread upwards in front of and behind any façade. Measurements are made of temperature and radiation.



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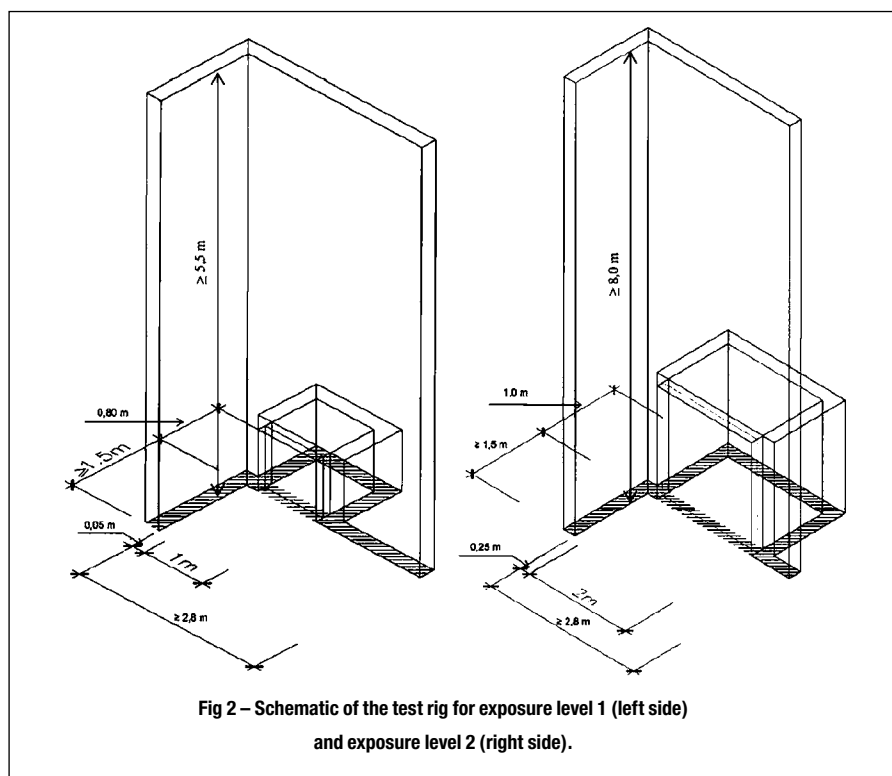


Fig 2 – Schematic of the test rig for exposure level 1 (left side) and exposure level 2 (right side).

may be lined with combustible insulation. The types of barriers used comprise expanded metal labyrinths or mineral fibre with an intumescent compound at the 'leading' edge, which will expand in a fire and block the cavity.

Despite the lack of agreement internationally for a fire scenario and test method for façades, there is still commercial pressure to develop fire tests for either complete systems or components for façades – recognising that any tests of components need to be linked to a large scale test and/or an agreed scenario. The Association for Specialist Fire Protection (ASFP) has developed a small scale test method for rain screen cavity barriers (TGD 19), which evaluates the fire resistance of cavity barriers in a simulated façade environment.

While still a furnace-based test, TGD 20 provides for a method of ensuring that such barriers close within a five-minute period and will allow manufacturers to test and certificate their products. The methodology in this test is being used in the development of a fire resistance test for cavity barriers in Europe.

## Large Scale Evaluation

Fires in façades are on the increase and will remain so for a number of years. Conventional fire tests are not appropriate in evaluating façades. Until we have a regularised system of evaluating façades on the large scale, using an internationally agreed scenario and test method, designs will proliferate which are unsafe and/or use unsafe materials.

Commercial pressure to use large amounts of combustible insulating materials in façades, together with the necessary presence of air gaps, means they will always potentially be very vulnerable in fire. Careful design and high quality installation are needed to reduce this hazard – not attributes for which the construction industry is well known. The use of cavity barriers in façades is crucial and regularising their performance is also important. The ASFP has developed a test method to rank such products until a larger scale test is developed internationally.

For further information, go to [www.asfp.org.uk](http://www.asfp.org.uk)

evaluate the contribution of the external wall cladding to the development and spread of fire. The scenario chosen was a fire in a room at the periphery of the building with flames venting from the window after flashover. It was considered that this is the worst case scenario and covers almost all other cases. The test would evaluate the spread of fire on the external surface and inside the external wall cladding system and the mechanical response of the façade, including flaming droplets and falling debris (see fig 2).

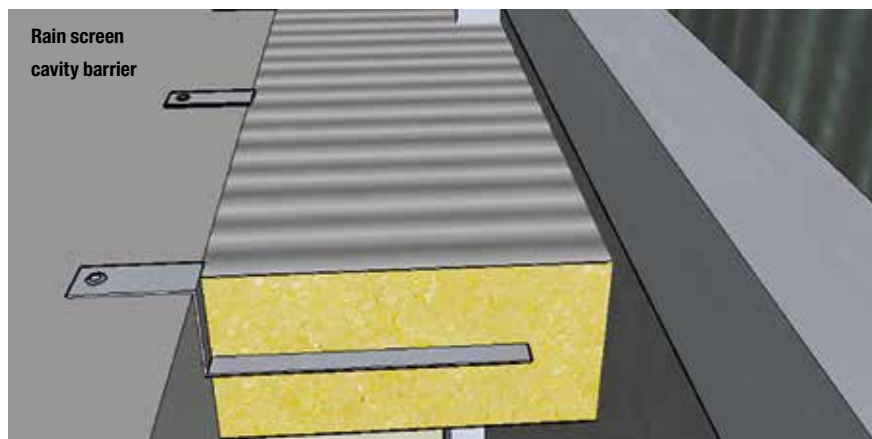
Although the test was developed, no funding for any validation tests was forthcoming and consequently the proposed test method remains just that. It is not currently referenced on the EOTA website. It is unfortunate that such a promising test – agreed by those with

a regulatory need, a commercial need and with practical experience – has not progressed further.

## Cavity Barriers

Key to the successful prevention of fire spread upwards and behind façades is the provision of fire resisting cavity barriers. These restrict fire spread behind the cavity both vertically (horizontally-oriented barriers) and horizontally (vertically-oriented barriers). The horizontal barriers preventing vertical spread are the most crucial.

Rain screen cavity barriers need to be 'open' in normal service to allow for ventilation and prevent condensation. Once there is a fire, they need to close relatively quickly in order to prevent fire spreading up inside the cavity, which



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# Firefighting Foam

## – Making Water Wetter

As a largely misunderstood firefighting tactic, the use of foam has at times been confusing to the fire service. The result is that many municipal brigades/departments have just avoided the use of foam, especially Class A foam and have transitioned to using emulsifiers or wetting agents.



**Dave Pelton**

Vice President,  
Global Marketing for  
The Solberg Company

While the end objective is to stretch valuable and at times limited water resources, it is more important to fully understand the fit for purpose of each of these technologies. This assures that these valuable tools provide maximum benefit. Foam is a very effective firefighting tool for flame knockdown, fire control, extinguishment, and burn-back resistance (Class B foam). Control, extinguishing time, and burn-back resistance are paramount to the safety of firefighters everywhere.

### What is Foam?

Firefighting foams have been in commercial use since the early 1900s. The National Fire Protection Association in (NFPA) 11 – *Standard for Low, Medium and High Expansion Foam*, Section 3.1.10, defines foam as: “a stable aggregation of bubbles of lower density than oil or water.” Foam is made up by three component parts: foam concentrate + water + energy. Energy can take the form of air or mechanical agitation and when added to foam solution (foam concentrate mixed with the appropriate amount of water)

finished foam is produced through means of a discharge device. The finished foam is very fluid and readily flows over liquid surfaces to extinguish fire in four ways:

- Excludes oxygen (separates fuel from vapour).
- Cools fuel surface (water content of foam).
- Prevents release of vapours (flammable fuel).
- Separates flame from fuel surface.

### Class “B” Foam

While there are many different types of foam concentrates available on the market, the two most commonly used forms are Aqueous Film Forming Foam (AFFF) and Alcohol Resistant Aqueous Film Forming Foam (AR-AFFF). NFPA Standard 11, Section 3.3.12.1 defines AR-AFFF as: “a concentrate used for fighting fires on water-soluble materials and other fuels destructive to regular AFFF or FFFP foams as well as for fires involving hydrocarbons.”

Section 3.3.12.2 defines AFFF as: “a concentrate based on fluorinated surfactants plus foam stabilizers to

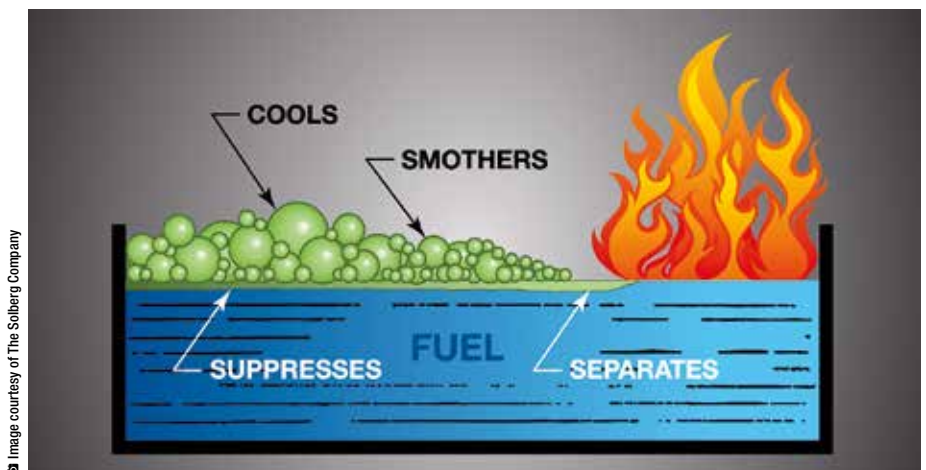


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produce a fluid aqueous film for suppressing hydrocarbon fuel vapours and usually diluted with water to a 1%, 3% or 6% solutions."

Each Class B foam concentrate is developed for a specific application. Some firefighting foams are thick and form a heavy, heat-resistant covering over a burning liquid surface. Other types of foams are thinner and will spread much more quickly over the fuel surface. Still, other types of foams will generate a vapour sealing film on the surface of the fuel. Additional foam concentrate types, such as medium and high expansion foams, can be used in applications requiring large foam volumes to flood surfaces and fill cavities within a hazard.

### Class "A" Foam

Developed in the mid-1980s, Class A foam was predominately used for wild-land fires but as their popularity grew throughout the 1990s the use of Class A foam was expanded for use on structural fires.

Class A fires consist of ordinary combustible materials such as paper, cloth, wood, and plastics. These type fuels require the heat-absorbing effects of water (cooling) or water solutions. Class A fires consist of two types: flaming combustion involving gases that result from the thermal decomposition of the

fuel. The second type is deep-seated or glowing combustion. This type represents combustion within the mass of the fuel and has a slow rate of heat loss and a slow rate of reaction between oxygen and fuel.

As a synthetic based foam concentrate, Class A foam is applied at low concentrations ranging from 0.1% to 1.0% (see proportioning rates below). Cooling and wetting are the primary extinguishing mechanisms. The use of Class A foam makes "water wetter" on average increasing the effectiveness of water tenfold.

### Typical Class "A" Foam Proportioning Rates

- Exposure Protection: 1.0%.
- Fire Brake: 0.75%.
- Initial Suppression or Fire Lines: 0.5%.
- Overhaul: 0.25%.

These proportioning rates make the use of Class A foam a cost effective means of combating fires because smaller amounts of foam concentrate can be used to make effective foam. Class A foam is biodegradable and non-toxic, so it is environmentally sustainable. Class A foam is deployed through a variety of portable and fixed appliance devices ranging from firefighters' backpacks, brush and fire apparatus, to rotary and fixed wing aircraft.

### Using Foam Increases Operational Efficiency

Many rural and small urban fire brigades have already embraced the use of Class A foam as part of their everyday operational tactics. Their use of Class A foam, quite simply, makes good sense for them. For any brigade that has to bring their water to the scene with them and has to establish water tanker shuttles, using Class A foam can easily increase operational efficiency of fighting the fire. The reason for this is that, Class A foam, when properly deployed, allows the fire to be extinguished more quickly and with far less water than would be required if it were not being used. On average, the use of Class A foam increases water's wetting capability ten-fold. In more simplified terms, "making water wetter." In addition, the amount of time required post extinguishment during overhaul or mop up is greatly reduced.

The use of firefighting foam by the fire service is not a single extinguishing solution, rather a tool (amongst many tools) that when combined with tactics create a more efficient operational scenario.

With the introduction of CAFS some brigades have taken the approach believing they could reduce water consumption (litres-a-minute) but the reality is whether using CAFS or traditional foam application appliances like line eductors or foam nozzles, water is still needed to suppress fire.

The use of foam, like other resources available to the fire service, is a force multiplier that when employed with traditional tactics stabilises the fire hazard thus allowing fire personnel to enter the structure for overhaul. While there are efficiencies associated with the use of foam be it advancements in system hardware technology or the foam concentrate itself, the use of firefighting foam and Class A foam in particular is an asset the fire service should not overlook for structural protection.

One area frequently overlooked for the use of Class A foam is zero lot line properties or multi-family dwellings where the likelihood of multiple exposure fire scenarios is high. The ability to use foam for both internal and external exposure protection and simultaneous active fire suppression is an extremely valuable



Image courtesy of The Solberg Company



CRITERIA	UL Requirements NFPA 18	UL 162 Requirements NFPA 11	NOTES
	Class A Wetting Agent (GOHR)	Class B Foam Liquid Concentrate (GFGV) [also suitable for Class A use]	Not comparable agents as indicated by separate listing and test criteria
<b>Fire Test</b>	1.5" depth n-heptane floated on water 50 sq. ft. (4.65m <sup>2</sup> ) 1 minute pre-burn	2.0" depth n-heptane floated on water 50 sq. ft. (4.65m <sup>2</sup> ) 1 minute pre-burn	55 US Gallons (208 liters) fuel on each test
<b>Application Rate</b>	0.2 gpm ft <sup>2</sup> (10 gpm nozzle) (8.15L/min/m <sup>2</sup> )	0.04 gpm ft <sup>2</sup> (2 gpm nozzle) (1.63L/min/m <sup>2</sup> )	Application rate for wetting agent test is 5 times higher with less fuel
<b>Exinction Time</b>	No time limit – pan must not overflow before extinction	3 minutes or less for full extinguishment	Unlimited dilution (emulsion) of foam providing pan does not overflow
<b>Water Type Used for Test</b>	Fresh water only (no salt water test)	Fresh water and salt water test performed	Wetting agent (emulsifiers) perform much better with fresh water compared to salt water
<b>Vapor Seal Tests</b>	NONE	2 seal tests conducted during 9 minute waiting period	
<b>Burn-back Test</b>	NONE	Foam blanket must resist breakdown from flame for 5 minutes after foam blanket has rested for 9 minutes post fire extinguishment	Critical for post fire security
<b>Polar Solvent Fuel Test</b>	NONE	AR type foam tested for use on alcohols and other polar solvent fuels	Fuel containing greater than 10% Ethanol considered polar solvent fuels. AR type foam for extinguishment

resource for those in the fire service. Another advantage in using Class A foam is that lower nozzle flow rates are capable of being used. Fire flow rates can easily be reduced by half or more when Class A foam is deployed.

### Wetting Agents & Emulsifiers – Alternative Products?

The use of firefighting wetting (mid 1960s) and emulsifying (early 1990s) agents were introduced to the firefighting community claiming use on Class A and B fires. The goal of these alternative agents is similar to foam agents in that they aim to reduce the surface tension of water. However, instead of forming a “foam blanket” on a Class B fuel surface, the solution is “vigorously” mixed with the fuel to form a non-flammable emulsion. Emulsifiers have limited foaming capabilities. Emulsifiers must be mixed with water at a given percentage and “forcefully applied” onto the entire surface of the burning fuel source. The resulting solution then mixes with the fuel, breaking it into very small droplets (the definition of an emulsifier). These droplets of fuel are surrounded or encapsulated by the emulsifier/water mixture to extinguish the fire.

The Underwriters Laboratories Inc. (UL) Directory defines wetting agents as: “liquid concentrates which, when

added to plain water in proper quantities, materially reduce the surface tension of plain water and increases its penetration and spreading ability.” Water to which a wetting agent has been added to is sometimes referred to as “wet water” because of its increased ability to wet surfaces it is applied to. Wetting agents improve the efficiency of water in extinguishing Class A fuel fires. Use on Class B combustibles require much higher application rates than those requiring foam agents and is limited to non-water soluble flammable liquids (hydrocarbons only). Little if any burn-back resistance is present on Class B fires extinguished with “emulsifiers or wetting agents.”

The NFPA Glossary of Terms defines an emulsifier as: “a chemical or mixture of chemicals that along with some energy input promotes the formation of an emulsion.” Use of emulsifiers or wetting agents does not afford use as a “fire brake or passive structural protection” (that is, exposure protection). In contrast to Class A foam the use of wetting agents and emulsifiers does not provide adequate exposure protection against radiant heat or an advancing fire. A note of caution here that Class A foam, wetting agents or emulsifiers should never be used on Class E (energised electrical) Class D (combustible metals), or Class F (cooking oils) fires as the water content

in these products is not compatible with the fuel hazard.

Shown above is the UL test performance criteria for wetting agents. It should be noted that there are distinct differences in the criteria for wetting agents versus foams. All too often questions arise from not only the fire service but industrial fire brigades, engineering firms and consultants as to “how does foam and wetting agents compare to one another?” There certainly is an argument that both are firefighting agents in much the same way that apples and pears are both fruits, but that is where it ends. Ultimately selection of any firefighting tool should be governed by product(s) being “fit for purpose” and having the appropriate third party certifications for the intended application.

In conclusion, the use of Class A foam just makes smart sense. It enhances a fire brigade’s ability to suppress fires more rapidly; improves water’s wetting capability thereby providing faster penetration and greater fire control, increases protection of personnel and maximises operational efficiency through the use of variable proportioning rates thus minimising post fire clean up time, and conserving valuable water resources.

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# Beware Of Counterfeit Fire Detection Devices

There can be fewer product categories where the consequences of using counterfeit goods can be as potentially catastrophic as that of fire detection equipment. Although the reported cases of imitation detectors are thankfully rare, the potential risks should never be underestimated.



**Paul Pope**

Business Innovation Manager –  
EMEA at Apollo Fire Detectors

So, how can customers take steps to ensure their fire detection products are the real deal, and avoid the dangers of fake devices, and what are the crucial testing processes that legitimate equipment must undergo?

One of the most notorious cases of counterfeit fire detectors took place in Atlanta, USA in 2011 where over 18,500 fake smoke detectors, which had been handed out free to low-income neighbourhoods by the Atlanta Fire Rescue Department, were recalled following an FBI investigation. Whereas this example undoubtedly falls into the rare category, it serves to highlight not only how even the most experienced of organisations can be easily tricked into buying counterfeit fire detectors, but also the extensive possible risk to human life.

When it comes to fire detection equipment, the rigorous design process, validation testing, testing before and during production and ongoing quality checks that authentic professional

companies carry out is key to the reliability of their life safety products. Counterfeit products may, to the untrained eye, look identical, but no copycat product will ever benefit the end user in terms of protecting and saving life as well as one which has been through the meticulous testing procedures of a genuine and reputable fire detection manufacturer.

If we take the testing procedures at Apollo as an example, the attention to detail in this rigorous process becomes clear.

## Testing Times

During and after the design process, the products are subjected to the most comprehensive testing and validation procedures to ensure performance and reliability to real life conditions is achieved. Apollo's site in the UK includes five test laboratories, which put every piece of equipment through its paces, not only as part of new product development, but also as ongoing quality control. These different laboratories, with state-of-the-art



Image courtesy of Apollo



equipment, cover every possible replicable scenario a product may encounter, from extreme environmental conditions to harsh electrical and radio interference.

The fire testing laboratory allows products to be tested in varying fire conditions, with the conditioning testing offering tests against a wide variety of different conditions, including fluctuating temperatures, humidity, vibration and shock.

The performance and verification laboratory comprises large scale heat, smoke and gas tunnels and the electro-magnetic compatibility (EMC) laboratory tests against a variety of factors such as noise, interference, static and lightning strike conditions. Finally, the audio and visual (AV) laboratory is used to test the performance of notification devices to exacting standards. This includes the use of a Hemi anechoic chamber, a room designed with a solid floor to completely absorb reflections of sound to eradicate noise distortion and simulate a quiet open-space of infinite dimension.

The combination of these five laboratories results in a highly stringent testing process where products are not only tested to exceed European regulations, but also the approval

requirements of every country to which products are supplied. Apollo, for example, holds in excess of 3,000 product approvals worldwide as well as a number of internationally recognised quality and environmental awards. Such is the strength of the test facilities, that Apollo is one of only a few manufacturers able to perform the majority of EN54 product standard tests.

Once the testing stage is complete, a product will proceed to the third-party testing stage for the appropriate certification, for example EN54, before heading to manufacture. The whole testing process can take anything from three to six months for a manual call point, to up to two years for a new fire detector. We then proceed to initial product manufacture where we will continue to stringently test every new product batch until we have 100 percent confidence. Manufactured products are continually tested, through both regular random sample testing and full annual product audits.

Because reputable manufacturers design, make and test their products from scratch, they can often 'go back to the drawing board' to address any viability issues that arise. Because counterfeit products are not based on this detailed

design and testing process, imitation device manufacturers cannot ever pay this level of attention to detail to their products.

### The Risks and How to Avoid Them

The two main dangers of counterfeit fire detection equipment are firstly, their non-compliance with industry standards, and secondly, the potential for non-compatibility within an overall fire detection system. In a situation where every single piece of equipment, no matter how small, contributes to the safe and effective working of a fire detection and alarm system, the consequences of failure due to counterfeit elements could be devastating.

To avoid these risks, the supply chain needs to take steps to ensure that the products it is supplying and installing are reliable and fit for purpose, particularly if they are dealing with a new or unknown supplier. The authenticity of fire detection and alarm equipment should never be taken for granted and should always be verified at source. At Apollo, for example, we publish all of our part numbers as well as their relevant certification and we are always happy to answer enquiries relating to a product's validity.

Checking the product certification is the first step in ascertaining a product's authenticity. At Apollo, the back of each of our devices displays not only the product number, but also the individual approval logos and relevant certification numbers that can be checked with the governing body concerned.

But what if a counterfeit manufacturer copies these logos and product numbers? Even the small details can give the game away: Counterfeit manufacturers may try and reduce costs wherever they can, and this reduction of quality often shows in their products. If you place a genuine fire product next to a fake one, there are a number of differences that can often be seen. An example of these differences includes the grade (quality) of materials, and therefore the colour of the plastics used. If the investigation is taken to the next level by dismantling a counterfeit product, you may see a marked difference compared to the original. Counterfeit products often use old technology with low cost boards and lots of copper compared to the modern layered



Image courtesy of Apollo

boards used today. Other differences include details such as the quality of the labelling, and even the fact that the font on the labelling may look 'cheap or different' – all signs that the products may be an imitation.

All of these pointers are valuable, but what if you are new to fire detection and alarm products, or have no genuine product against which you can compare?

The advice that we give would be to always use a reputable distributor or supplier, do your background research by looking at a company's website and checking your device against the images and certificates shown and to use your common sense when it comes to price. Cost will almost always be the strongest indication when it comes to looking out for the warning signs of counterfeit products, so if a product appears too cheap then it is worth making additional checks. If a product's price is too good to be true, it usually is.

### Independent Certification

LPCB provides the independent, third-party certification of fire and security products and services worldwide and Apollo has been working with them for many years. Speaking about the issue of counterfeit fire detectors, LPCB International Business Development Manager, Tony Dodkin, says: "The certifications that LPCB carry out give independent confirmation by an expert third-party that a product, system or service meets, and continues to meet, appropriate standards. Certification gives suppliers and purchaser's confidence that products and services will perform as expected – through a combination of regular company audits and a schedule of ongoing auditing.

He continues: "Our certification work in the fire detection industry sees us not only examining and certifying a new end product, but also carrying out factory inspections at manufacturers' premises, random product audits and equipment checks. We do receive requests from installers and distributors questioning the validity of new products that they are looking to install or stock or checking that certification numbers are authentic, and we welcome this level of vigilance. As well as checking directly with us, anyone wanting to check a genuine approved product can search the industry "red book" – an online



Image courtesy of Apollo

resource (redbooklive.com) that lists all certified manufacturers and their products. All users need to do is type in the certificate number and they can see a description and any additional testing details.

He concludes: "The fire detection industry is often perceived as one which is slow moving in terms of new technology, but there is no doubt that it is also one of the most driven in terms of industry standards and legislation. By taking advantage of checking a product against these many certifications, people can avoid the pitfalls of counterfeit devices."

### Conclusion

Going back to the example of the Atlanta Fire Department, we can see how even simple checks can protect against counterfeit devices. Part of the investigation into the supply of the fake devices discovered that a simple five-minute Internet search looking at the federal Excluded Parties List System would

have revealed that the counterfeit supplier, Silver Sails, was banned from doing business with the federal government.

As a result of the case, the City of Atlanta implemented a new policy as part of its procurement process to check the background of every company that bids on goods in Atlanta, not just the fire department, and also requests samples of all products to check their validity.

At Apollo, we cannot stress enough how crucial it is for purchasers to take this level of responsibility to ensure that they are installing and maintaining an authentic fire detection product and one that is fully warranted. A true manufacturer's product will, above all else, protect and save lives, and any building owner has the significant responsibility to customers, staff or whoever uses their facilities to ensure that this responsibility is taken seriously.

**For further information, go to  
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# The Causes of False Fire Alarms in Buildings

False alarms from fire detection and fire alarm systems are a problem worldwide, but their underlying causes are not well understood. This article reports on research to investigate the causes of false alarms with the aim of identifying measures to reduce them.



**Raman Chagger**  
Principal Consultant  
(Fire Detection) at BRE

A false alarm is a fire alarm signal from a fire detection or fire alarm system that is not caused by a fire. Examples include:

- A fire-like phenomenon (e.g. a smoke machine triggering a smoke detector).
- Accidental damage to the system.
- Inappropriate human action (for example, malicious manual call point activation).
- Equipment malfunction.

## Why are False Alarms a Problem?

False alarms from remotely monitored fire detection and fire alarm systems cost businesses and Fire and Rescue Services (FRSs) an estimated £1 billion a year in the UK. In the period 2011-2012 FRSs in Britain received 584,500 callouts; 53.4 percent of which were false alarms. As well as being a considerable drain on fire authority resources, this causes business disruptions (leading to a loss of productivity) and reduces the confidence of the general public in fire alarms. More

seriously there is also the risk of fatalities resulting from traffic accidents while brigades rush to attend false callouts.

The BRE Trust has funded a research project to collate information about the underlying causes of false alarms observed in buildings, with the aim of identifying measures that could reduce their occurrence.

## Why Research This Topic?

Considering the losses associated with false alarms, one might expect the problem to be well understood. However, as there is no single organisation responsible for investigating false alarms or providing guidance on reducing them, there is little data available.

UK FRSs produce Incident Reporting System (IRS) reports on all callouts attended, but the section relating to false alarms produces generic descriptions from which little can be inferred about the underlying causes. While these are the closest we get to false alarm "investigations" in the UK, they are often



Image courtesy of BRE

## THE CAUSES OF FALSE ALARMS

conducted by untrained personnel with little knowledge of the detectors and fire alarm systems, the codes to which these have been installed, or the physics behind the plethora of “fire-like” phenomena.

### Who has the Data?

Identifying potential contributors with reliable false alarm data proved to be a time consuming exercise that confirmed the scarcity of those involved in gathering such information. However, two contributors were identified, Kings College London and Buckinghamshire and Milton Keynes Fire Authority.

### King College London (KCL)

KCL manages an estate comprising 74 buildings that include lecture theatres, residential accommodation, libraries, laboratories, teaching rooms, offices, restaurants and a chapel. These were built between 1830 and the present day and contain fire detection systems that were installed at various times over the past 20 years. The KCL premises cover a floor area of over 400,000 square metres and, as with all premises of this size,

have experienced a number of false alarms over the years.

Since 2007 KCL's Senior Fire Safety Officer has instigated and led a very proactive approach to the issue of false alarms, which involves engaging with KCL personnel, contractors and users on multiple levels to reduce their occurrence. The strategies adopted include:

- Effective incident reporting.
- Follow-up investigations by suitably qualified personnel.
- Control of contractors.
- Procedural guidance.
- Suitable internal responses.

### Results from KCL

KCL generates a yearly internal report with a log of all events leading to an alarm activation. This includes detailed information on the location, cause and current status of the incident. It can clearly be seen from the following table that the follow-up investigations, controls and guidance have led to a significant reduction in false alarms, particularly those generated in halls of residence.

Year	Academic Buildings Activations	Halls of Residence Activations
2009-2010	148	135
2010-2011	147	131
2011-2012	151	84
2012-2013	148	38

Some of the noteworthy strategies used by KCL for reducing false alarms include:

- Gathering and maintaining reliable data.
- Communicating this data.
- Using pre-alarm states during which an investigation is conducted.
- Working closely with one fire alarm service provider – this ensures appropriate action is taken and effective maintenance is in place.
- Greater control over and communication with contractors to isolate zones and devices during works.

### Review of KCL Data

KCL provided data from 699 false alarm incidents. After a thorough review of this data, six types of physical interventions were



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identified that may have prevented false alarms. These are detailed below in descending order of the proportion of false alarms they can potentially resolve:

- Replace single-sensor detectors with multi-sensors (69.2 percent).
- Use appropriate approved detector/s that are correctly located (43.5 percent)
- Use protective covers over approved manual call points with adequate signage and CCTV where required (16.7 percent)
- Use EN 54-2 approved analogue addressable panels (10.2 percent).
- Improve the control of contractors (9.7 percent).
- Carry out more rigorous maintenance of the system (6.0 percent).

Of the solutions proposed, the replacement of single-sensor with multi-sensor detectors appears to be the simplest and most effective. Multi-sensor detectors respond to more than one of the fire signatures, that is smoke, heat and carbon-monoxide, released during a typical fire. Multi-sensors often increase sensitivity levels when more than one fire signature is present, thus ensuring a quicker alarm response than a single-sensor detector.

#### Cost Benefits

The cost of false alarms to businesses is estimated to be around £2.9k for each alarm. The cost of a standard optical/heat multi-sensor is reported to be between £5 and £10 more than that of a standard optical detector. This indicates that replacing problem detectors in areas where false alarm risks are high is a cost effective solution.

#### Summary of KCL Data

The data supplied by KCL provides a snapshot of the types of false alarms that are observed in a wide variety of commercial and residential buildings. Although not representative of the UK as a whole, the data provides valuable information on common false alarm causes. However, in order to properly quantify the effectiveness of the proposed solutions for resolving false alarms, they would need to be implemented in the field and monitored over a period of time.

#### Buckinghamshire & Milton Keynes Fire Authority (BMKFA)

BMKFA employs perhaps the UK's only Unwanted Fire Signals Officer (UFSO). The UFSO's role is to investigate unwanted fire signals (UFSs) by making contact with offending premises, providing guidance when required and identifying corrective actions to reduce the likelihood of further UFSs. As a result BMKFA have successfully reduced fire alarm signals by 45 percent over a seven year period (from 3308 alarms in 2005 to 1815 in 2012) in Buckinghamshire and Milton Keynes.

#### BMKFA Methodology

The UFSO reviews the data generated by his colleagues (recorded in the IRS database) to identify the worst offenders in relation to UFSs. He then engages with four or five premises a week, where a phone call or an email is often sufficient to identify and solve the problem. If not, a site visit is arranged with the designated

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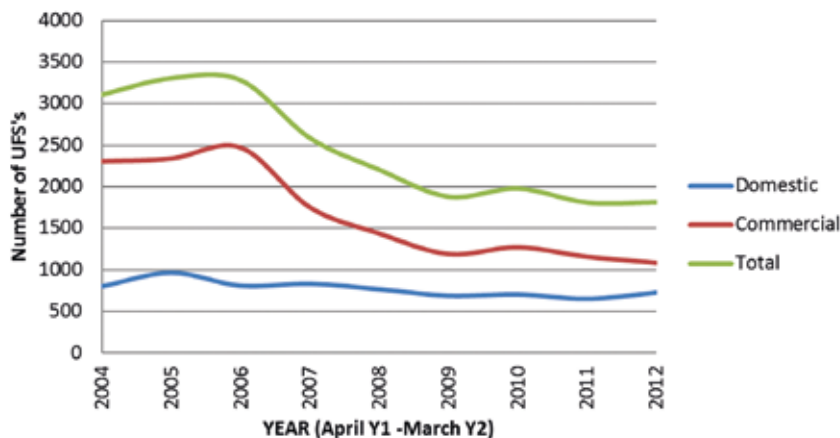
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The UFS trends for BMKFA in premises from 2004-2013



“responsible person” to identify the cause and propose solutions.

The corrective measures implemented and their long term results have not been recorded electronically, so statistical data was not available for use in identifying the frequency and type of successful interventions. However, the UFSO was able to provide anecdotal accounts that provided valuable information.

## Review of BMKFA Data

The research was conducted by analysing data generated from the IRS for BMKFA. The common types of UFS observed and reduced over the years were also reviewed. In addition the methods implemented by building owners and users to reduce UFSs were analysed.

The following strategies have been shown to reduce false alarms:

- De-rating heat detectors (i.e. reducing their sensitivity).
- Using domestic point smoke detectors for local warning, with a heat detector linked to an alarm receiving centre (ARC).
- Isolating zones prior to construction works and cleaning smoke detector covers prior to their removal.
- Having processes in place to ensure that the cause of every UFS is picked up and measures are introduced to prevent re-occurrence.
- Ensuring that there are proper procedures in place to train new staff on how to deal with UFSs in premises with high staff turnover (for example hospitals).

- Advising the fire alarm maintenance company when there is a change of building use.
- Educating users and responsible persons that they are connected to an ARC and an UFS will result in a callout, as well as providing guidance to identify and report false alarms effectively.
- Encouraging greater communication within an organisation, for example the fire safety manager should know when building contractors are due.

BMKFA recommends that for commercial buildings:

- A designated person is made responsible for, and is familiar with, the fire alarm system.
- Fire alarm systems are regularly checked.
- The correct detection is in place and is situated in the most suitable location.
- False alarms are investigated, when practical, before calling for help.
- False alarms are followed up and action is taken to prevent re-occurrence.

Reducing the number of false alarms from domestic premises remains a challenge across the whole of the UK even though the vast majority are reportedly related to cooking incidents. Educating homeowners on effective installation and use of detectors in and around kitchens is likely to lead to the greatest reduction in false alarms.

## Cost Benefits

BMKFA has reduced the number of false alarms by 45 percent over seven years, which amounts to an estimated cost saving of around £450k a year. This confirms that their strategies provide an effective means of reducing UFSs and keeping them low as new buildings come “on-line”.

If the methods used by BMKFA could be used to the same effect in the rest of the UK, FRSs could save an estimated £42 million a year. Furthermore the same percentage reduction could save UK businesses approximately £408 million a year.

## Conclusions & Further Work

As has been shown, there are many ways of reducing false alarms, often using simple methods. Educating building owners, responsible persons and the general public can contribute significantly to false alarm reduction. Also, the increased use of multi-sensor detectors may avert false alarms from common causes such as cooking fumes and steam. Further details of this work can be found in a briefing paper available from the following website address: <http://www.bre.co.uk/podpage.jsp?id=1752>.

The use of a technical and experienced individual assigned to investigate and reduce false alarms has proven to work in the field for both KCL and BMKFA. It is recommended that such an approach is used to investigate and reduce false alarms.

Further work is due to take place with a number of interested parties, including the Scottish Fire and Rescue Service. As part of this work a false alarm investigator will assist FRS crews as they attend false alarm incidents. This will ensure rapid investigation of these incidents and an increased likelihood of accurate diagnosis of the cause. This investigation, which has not to our knowledge been done before, is expected to gather sufficient data to conduct the statistical analyses needed to accurately identify and classify the causes of false alarms. It is hoped that the resulting measures and guidance, when incorporated, will lead to a wider reduction in false alarms and the losses associated with them.

**For more information, go to [www.bre.co.uk](http://www.bre.co.uk)**



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# Mission Control

Control and alarm panels are the “mission control” of any detection or fixed suppression installation. So, hardly surprising, the leading manufacturers devote considerable time, energy and money developing new solutions and adding improvements to existing models to make them more user-friendly, reliable, versatile and efficient.

## System Offering Suits All Sizes

TYCO FIRE PROTECTION PRODUCTS has launched a new fire detection and alarm system under its Zettler brand. The Profile range of control panels uses MZX technology to provide fire detection technology for a wide range of applications in the commercial, retail and public building sectors.

The system is engineered for ease of use and features a 213mm TFT colour touch screen user interface, making the system suitable for architecturally sensitive settings. In addition, the system allows for a range of repeaters with different mounting options that can be used to match the surroundings. This enables system integrators to install repeaters over the IT infrastructure using IP cable structures, with no compromise on the positioning of the panels.



The panel integrates numerous functions aimed at increasing the flexibility of the technology, not only for the first installation, but throughout the system's lifetime. It offers a fully customisable home screen for adoption of the user's corporate identity. A multilingual interface, an ergonomic icon display and an info-button for intelligent navigation and context sensitive instructions.

Log-in is via an RFID tag, which replaces the conventional key switch. This capability offers enhanced security and allows identification of individual operators, plus complete traceability of all actions performed on the fire panel. For existing fire panels with MZX technology, backwards compatibility ensures that they can be networked together with new Profile panels. Touch sensitive LEDs provide detailed status summary information in just one click to ensure a fast response to all system events.

**For more information go to**  
**[www.tycosfbp.com](http://www.tycosfbp.com)**

## Touch-screen Panel Unveiled

C-TEC's new touch-screen controlled ZFP addressable fire alarm panel is fully compliant with EN54-2/4 and features ten different programmable indicator and switch modules, eight different expansion 'A-Bus' PCBs and two compact mini-repeaters for push reception areas. Systems can be easily and quickly 'built-up' to suit any site, no matter how complex; from small 'one out, all out' systems to large multi-loop networked systems with sophisticated cause and effects.

Up to 64 eight-loop panels can be interconnected over the ZFP's high-integrity fault tolerant network. Each panel possesses a 109mm full colour touch-screen to provide constant feedback on all aspects of system activity.

As well as having access to a range of 'standard' off-the-shelf ZFP panels, customers can select a ZFP configuration to exactly suit their requirements for larger, more complex projects. Three master cabinet sizes are available and all come with a control and display module, a two-loop main PCB and a 3A or 5A EN54 power supply. Depending on the application and cabinet size selected, additional indicator and switch modules can be added, together with other options such as additional loop drivers, a network card, one or more A-BUS PCBs, flush mounting bezels and more.

**For more information go to**  
**[www.c-tec.co.uk](http://www.c-tec.co.uk)**





## New Addressable Control Panel Launched

EATON has introduced an enhanced entry-level intelligent addressable control panel with a number of new features to meet industry and regulatory requirements. The introduction of the new CF2000 unit has been developed with smaller applications in mind, with a simple interface that is designed to give customers complete and easy control.

The new CF2000GCPD can be configured for either one-loop or two-loop operation, with up to 200 addresses on each loop, designed to allow fast and accurate identification of a fire alert's location. Equipped with four sounder circuits, the panel is certified to EN54 parts two and four.

The new panel features a graphical display providing the user with a simple yet comprehensive menu-driven end-user interface. With the ability to fully support Eaton cause-and-effect programming and a wide range of easy-to-operate end-user control functions, the new control panel is suitable for a variety of applications – ranging from small warehouses to small-to-medium office developments, as well as many small industrial applications.

As with all Eaton intelligent addressable panels, the CF2000GCPD uses 'spur tolerant' soft addressing to minimise installation time and remove the potential for errors associated with many forms of manual addressing. The back box of the new control panel can be surface mounted with cable entry points in the top, bottom and rear. The mother board and power supply are mounted on a sub chassis, which is easily removed to aid panel fitting.

As it can operate as a one-loop or two-loop panel, it is able to carry up to 400 addresses on both loops combined. Using Eaton system protocol, the panel 'auto-learns' the equipment mounted on the loops and 'soft addresses' each item. This ensures a simple setup procedure while reducing the time required. All loop-mounted equipment has integral short circuit isolators fitted ensuring loop integrity is maintained should a short circuit fault occur on the loop. The new panel also features a comprehensive range of interface units including the CSI350 spur isolator that permits Eaton intelligent addressable sensors to be connected to the loop as a spur.

**For more information go to**  
**[www.eaton.com](http://www.eaton.com)**



## Conventional Panel has Networking Capabilities

HAES has extended its range of conventional control panels with the introduction of a new control panel that is available with 16, 24 or 32 zones, has four sounder circuits as standard and boasts non-latching zones, programmable output and sounder circuit responses to zones, silent zone mode and a programmable delay timer that can be applied to outputs in response to zones.

In addition to up to 32 zones and four sounder circuits, the new control panel also provides common fire and common fault, VFCO relays; 4 x switch negative inputs for remote silence alarms, reset, class change (sounder circuit activation) and alert (sounder circuit pulsing); and 4 x switch negative programmable outputs that are factory set to operate for fire, fault, reset and disablement. The function of these outputs, however, can be changed in the engineering settings.

The new panel also features false alarm management programming that operates in one of three different modes: A, B and C, as described in EN54-2.

The introduction of the 32-zone panel has a new networking feature, with networking available on all standard panels with software version 4.0 and above, up to a maximum of eight control panels or 256 zones. In addition to the eight control panels, up to eight remote display units can be added to the network.

The new, fully functional, LCD remote display unit will display all fires and faults across the network as well as control, silence and reset, set disablement and test mode of any zone and control sounder circuit, aux and F.A.R.E disablements for the entire system.

Any combination of panel size can be used from 2-zone to 32-zone and in any order. The panels are wired in a fault tolerant daisy chain loop and use RS485 communications.

**For more information go to**  
**[www.haes-systems.com](http://www.haes-systems.com)**

### Small-to-Medium Application Addressable Panel

CHUBB FIRE & SECURITY has launched ControlMaster, an addressable fire panel specifically designed for small to mid-sized applications. It offers easy-to-use configuration options, integrated signaling controls and extended connectivity. Additionally, the range's design allows for rapid installation while ensuring long-term flexibility for the system owner. The ControlMaster range comprises one-loop and two-loop panels, repeaters and a full set of addressable detection and audio visual devices.

The new ControlMaster range is accredited to EN54:2 and EN54:4 standards and is Construction Products Directive (CPD) approved.

For more information go to  
[www.chubb.co.uk](http://www.chubb.co.uk)



### New Repeater Panel

FIKE SAFETY TECHNOLOGY has launched a repeater panel as part of its TwinflexPro two-wire fire detection system. The repeater panel is a small remote display unit that can be connected to a four or eight zone version 2 TwinflexPro panel via an RS485 data link, with a maximum of eight repeater panels connected to a single control panel.

The unit does not itself connect to or control any devices; it simply reports all fire and fault events that occur in the system. It can also perform system actions over the data link (such as silence alarms, reset, sound alarms and silence buzzer). It is intended to provide display capability at secondary building entrances, nurses' stations and at any location where the panel event information is required to be displayed.

The system has the ability to differentiate between call point and detector alarms; can accommodate a maximum of 32 devices for zone; has separate fault monitoring display for each zone; incorporates a man walk test facility and zones can be configured without the need to use resistors or capacitors. Fike can also provide a special output unit. This is ideal for connecting to equipment such as plant shutdown controls and door release mechanisms.

For more information go to  
[www.fikesafetytech.co.uk](http://www.fikesafetytech.co.uk)



### False Alarm Management and Conventional Panel Offering

AlarmCalm is the new false alarm management (FAM), solution from ADVANCED. A combination of panel firmware, configuration software and intelligent, loop-powered alarm acknowledgement devices, it delivers what Advanced says is: "a complete solution to false alarm management, that will suit almost any building or site strategy and promises to radically reduce false alarms."

AlarmCalm provides total control over alarm verification periods and investigation delays to outputs. It allows a site to be divided into false alarm management zones called building areas (up to 200 per panel or 40,000 per network). These are virtual areas that can be independent of fire zones and can share grouped or have individual FAM settings. Verification settings can be applied quickly and easily for a site by assigning all common areas of a building with group settings, while allowing specific areas to have individual settings.

QuickZone is Advanced's conventional and DIL selectable twin-wire (sav-wire) solution. It is described as being: "quick on the wall, quick to configure and quick to maintain". It comes in 1-12 zone formats and the range includes a fully functional or passive repeater. Approved to EN54 2&4 the two QuickZone main panels come in single zone or 2-12 zone formats. It is compatible with any conventional detector.

For more information go to  
[www.advancedco.com](http://www.advancedco.com)





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# Fire Watch and Industry Oversight

Just as fire safety is a concern in many aspects of our everyday lives, there are many factors that influence how individual protection systems are designed, how components are selected and how they are integrated into buildings for effective use.



**Joseph Iovacchini**  
Product Certification  
Specialist at Victaulic

Codes, standards, product certifications, insurance requirements and building regulations all play a role in the design of the final installation that provides a vigilant “watch” over a building’s structure and its occupants.

Architects, designers and the writers of specifications have a wide range of choices today when it comes to both the “skeletal” or heavy structure of modern buildings as well as the interior finishes. The trend towards the use of lighter weight and sustainable materials in recent years has prompted changes in the

fire codes along with much discussion concerning various methodologies in both passive and active fire protection.

Because the occupants of a building always need easy and safe egress in the event of a fire, there is significant focus on these elements in the design and planning stages, whether the building is an office, hospital, school, restaurant or other public venue. The ability to move people quickly to a safe location is a primary concern to the safety engineer and building design teams. While this “passive” approach is important for obvious reasons, there are additional



◀ Testing is an investment  
and obligation to customers.

Image courtesy of Victaulic





► Use of “active” suppression methods has gained interest.

Image courtesy of Victaulic

measures available for today’s fire safety engineers to enhance the protection of the building and its occupants.

The use of “active” fire suppression methods has gained widespread interest in recent years, as a well-defined measure of proven life safety and property protection for a broad range of applications. For example, the use of fire sprinklers has achieved tremendous acceptance and popularity in both the ability to protect occupants as they exit a structure, but also to reduce fire damage and repair cost for a building owner.

Additionally, fire sprinklers serve specific purposes in controlling the spread of fire, while also enabling fire brigades to enter buildings under a reduced level of risk to their own safety. These are important benefits to all concerned, particularly the property insurer who will benefit from reduced damage and personal injury claims.

### Insurance & Risk Management

The cost involved for insuring a building depends on various factors, such as the building usage, the known hazards or

stored materials, occupancy rates and available means of egress, locations or proximity to local fire brigade responders, as well as the location of the basic water supply itself. For example, in many regions a multi-story concrete parking garage holding gasoline-filled automobiles is viewed very differently in terms of hazard classification as compared with a single story cement block school building. The building materials are quite similar; however the combustible storage classification is significantly different.

As insurance premiums continue to rise, owners and their developers are seeking enhanced fire safety methods that will reduce risk to the occupants and structure, while keeping their annual costs to an affordable level. Therefore they work closely together with their insurance representatives to attain the proper balance of “fire resistance” and passive / active fire protection.

### Why Approvals are Necessary

While Victaulic is a global leader in the design and manufacturing of a wide range of active fire suppression systems and

system components, the company views fire safety in a much greater perspective. This includes support and active participation on codes and standards committees in the UK, Europe and many other regions.

These fire code committees view life safety as the highest priority, and seek a broad range of expertise in advancing fire protection that will coincide with the changes in building codes. The interaction in these committees with manufacturers, designers, contractors and code officials provides a broad educational experience that enables companies to maintain a balanced perspective when contemplating a new product design or technical innovation.

Another factor that plays into these discussions throughout Europe is government mandated legislation, such as the recently adopted Construction Products Regulation (CPR) (No. 305/2011), which came into effect in July 2013. One of the most important elements of the CPR is that it establishes a “level playing field” for the manufacturers of active fire safety system components, by requiring “Declarations of Performance” that confirm compliance with the product testing requirements of specific Harmonized European Norms (hEN).

Where a hEN exists, products must also carry a CE mark to show they are in compliance with the appropriate Annex ZA, which lists the regulated requirements and clauses that must be met in order for the products to be placed on the market in Europe. The CE mark is not a quality mark, but shows that a product meets the minimum regulatory standards of health and safety as laid down in the regulation. Additionally, documented test data may be requested by other agencies or Notified Bodies that must also certify the products for installation in various types of construction.

### Agency Requirements

The Loss Prevention Certification Board (LPCB) is the certification brand of BRE Global for fire and security products and services operated by BRE Global Limited, a wholly owned trading subsidiary of the BRE Trust (a registered research charity). Along with the Fire Protection Association (FPA), the LPCB plays a huge role in both the oversight of the standards



development process and the way that active fire system products are tested and certified for installation in the UK.

Victaulic has worked closely with the LPCB for over 25 years and values the "LPCB" mark on hundreds of its products. It is a visual sign of regulatory excellence and an affirmation that the highest safety standards have been achieved which is sought after by the building industry.

The management and staff at LPCB/BRE are fully engaged in the planning and development of new test methods for a wide range of applications and real world conditions experienced in the field. The testing schemes are some of the most stringent in the industry and result in the screening of potentially inferior products from reaching the consumer. The organisation also provides field surveys and inspections of system installations to ensure that LPCB certified products are being installed in accordance with the manufacturers' instructions and by certified contractors.

### Importance of Selecting Proven Products

It is in the specification and installation of the fire protection system that the building owner and their insurance underwriter have the greatest influence

with the construction manager and fire systems contractor to ensure the best products are selected for their property and its occupants.

There can be serious consequences, such as system malfunctions, if engineers and installers select fire protection products that:

- Do not comply with the design and installation requirements of codes such as the LPCB sprinkler rules.
- Are not third-party approved.
- Do not carry the CE mark to the relevant harmonized European norms.

The use of potentially inferior products, which are not proven fit for purpose for each building application, can be avoided by ensuring that the products also carry the LPCB certification mark and are installed by approved contractors. This will in turn reduce the risk of reputational damage and financial liability to those who choose to use them, as well as improving the safety of building occupants.

### The Role of the Manufacturer

When a reputable company starts out with a new product concept, there are many hours of development time dedicated to research and design validation.

Ideally product designers are very knowledgeable about the end application and they systematically build-in the performance requirements up front. They would then conduct a series of trial tests to verify the intended ratings are achieved consistently and repeatedly. The trials would include a series of tests that fully duplicate that of the certifying laboratories like LPCB, and it is not unusual to have each test in the agency qualification standard replicated several times throughout the course of the product development process.

Once all certification criteria have been satisfied, then additional product samples are prepared for the agency's laboratory. Appropriately, the more critical the component, the greater the testing scrutiny will be. Obviously, this can be a very time-consuming and costly process, however a company such as Victaulic typically view this as a necessary investment and an obligation to its customers as a major supplier of active fire safety products in the industry. Ensuring a client is working with the best possible products, made to exacting standards, using the best quality materials and workmanship is an important responsibility.



Images courtesy of Thinkstock/Dan Kitwood



Image courtesy of Thinkstock/Jeff J Mitchell

### The Testing Process

Performance qualification of active fire suppression systems and components is among the most stringent of all industries. While fire suppression systems sit quietly for months and years in a static condition behind walls and ceilings, they must work flawlessly and immediately in a real-life fire event.

This is where the agency testing process is a key element in determining whether these products can meet the required performance criteria set out in the relevant LPCB and EN Standards. For example, fire sprinklers undergo more than 40 individual qualification tests including (but not limited to) response time/activation temperatures, water distribution, flow coefficient (K-factor), frame and deflector strength, glass bulb loading, vibration, water hammer and many more.

Similar products are also subjected to temperature extremes, highly corrosive environmental exposure, pressure and bending stresses, as well as seal integrity and durability of coatings. Each test is designed to

replicate known field conditions that occur routinely in typical installations and under various environmental extremes. All system components, from the pipe joining products to the valves, alarm systems and sprinklers themselves, undergo significant evaluations to ensure complete continuity and functionality when called upon in a real emergency.

### Social Responsibility

When a fire event is reported by the local media involving the loss of life, it is normal for the individuals and neighbouring communities that are directly impacted to ask “what can be done to prevent this from happening again?” The answer is; “many things can and are being done.” From fire research to independent laboratory testing, the development of new innovations and fire safety technologies is a rapidly growing and competitive industry.

Each year, thousands of representatives from various interest groups, including manufacturers, property insurers, contractors, code officials, regulatory bodies, building

owners and others, gather in committees and trade forums to discuss the latest developments in fire safety technology and witness demonstrations that are changing the way we look at these issues.

The global marketplace and electronic media have accelerated the sharing of information and have also helped to educate all consumers of what is available to them along with a financial analysis.

### Designs for Life

While retro-fitting an existing building with an active fire suppression system can come with challenges, manufacturers and installation contractors are constantly working together to share ideas and help innovate new solutions together. This is a well refined process where solving a contractor's installation difficulties is as equally important as developing the latest new series of products or systems. Through such collaborations, contractors become more aware of their responsibility to seek a best-practices approach and are given new opportunities to provide feedback on new products and installation remedies that can greatly improve the consistency and operational reliability of their installations.

As a result, installers gain a much better understanding of the reasons to use agency-tested and certified products as a means of ensuring proper protection for the owner, as well as reduced or eliminated liability for themselves.

For new construction, there is no adequate justification for omitting some combination of passive and active fire systems to protect life safety and ensure that the building is preserved for many generations to come. When the structure is wide open with clear access for running pipework, wiring and other components, there is a tremendous logistical and financial advantage to install active fire protection products.

The ease of installation and placement of active components make this the perfect time to be “building in” the life safety components that will be there to protect the workmanship of the other trades as well as the furnishings and the lives of occupants.

**For more information, go to  
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# Fire Resistant Cable Test Standard Revised

BS 6387 is a long-established British Standard that defines methods for testing an electrical cable's resistance to fire. The cable needs to maintain circuit integrity under specific fire conditions, meaning it must not short circuit, stop working, nor suffer loss of continuity.



**Dr Jeremy Hodge**  
Chief Executive of the  
British Approvals Service  
for Cables (BASEC)

This standard is only relevant to a certain type of cable – those not exceeding a 600/1000 volt rating, with an overall diameter less than or equal to 20mm, and it does not include single core cables. The previous edition of the BS 6387 standard was published in 1994 (known as BS 6387:1994) and detailed eight fire performance categories that the cable could be tested against. On December 31st 2013, a full revision of the standard was published, BS 6387:2013, and it now retains only the three most stringent categories for the fire resistant characteristics of the cables – the three toughest tests to pass!

In a real-life situation, these types of cable are used throughout buildings such as hospitals, schools, shopping centres, stadiums and high-rise buildings, supplying electricity to critical systems such as emergency lighting, fire alarms, computer systems and voice evacuation controls. All these evacuation and communication systems require electrical power and control circuitry to remain

fully functional throughout a potentially serious fire that could rage for many hours. Therefore, it is vital that power supplies remain intact for a sufficient period to help occupants vacate the building as quickly as possible and to assist the fire brigade in tackling the fire. Although they may be small cables, they need to be robust not only to fire, but also to impact damage and the effects of water spray from fire sprinklers or firefighting operations.

Testing and certification bodies cannot test cables for every fire-related eventuality. However, by having consistent testing methods detailed in standards such as BS 6387:2013, this ensures that cable products provided by manufacturers for test can be directly compared to ensure performance is benchmarked. This new revision was co-written and approved by a committee of a dozen different organisations including cable manufacturers, material suppliers, testing and certification bodies, and fire alarm system manufacturers.

**Note:** The photographs in this article show the BASEC laboratory set up for commissioning trials and are indicative of test conditions.



Image courtesy of BASEC



### The New Test Method

BS 6387:2013 now specifies that the cable has to pass each of the three fire tests C, W and Z. At the time of the test, each cable is set up within a specialised fire testing facility and is energised to 600V while connected to a number of light bulbs and fuses. This provides the test technician with a visual indicator that the cable can sustain performance in the fire tests, or not. Separate test pieces from the same sample of cable are tested to each of these three protocols:

#### ■ C Test

- ▶ This is a fire-alone test at the highest temperature, for the longest time.
- ▶ Temperature of attack: 950°C ±40°C.
- ▶ Time: 3 hours.

#### ■ W Test

- ▶ This is a fire and water test simulating a sprinkler system.
- ▶ Temperature of attack: 650°C ±40°C.
- ▶ Time: 15 minutes fire and 15 minutes sprinkler.

#### ■ Z Test

- ▶ This is a fire test with an indirect mechanical shock.
- ▶ Temperature of attack: 950°C ±40°C.
- ▶ Time: 15 minutes of fire with impact every 30 seconds.

In the previous standard, BS 6387:1994, there were another five lower-level tests as well as C, W and Z tests. However, C, W and Z are the hardest tests to pass and most cables marketed have adopted these grades. Also, additional electrical and mechanical cable tests have been removed from BS 6387, leaving only the three C, W and Z fire test protocols.

### Not as Clear-Cut for Cable Manufacturers

Cable manufacturers need to be aware that the BS 6387:2013 revision is now in force and it will affect cable manufactured from 2014 forward. It also has implications on what manufacturers can legitimately claim.

With the removal of the five lower-level fire tests and the other cables tests from the standard, certain grades of cables or custom-designed cables will no longer have a recognised standard against which they can be tested and approved. This means that cable manufacturers will now need to set their own specifications for these cables. As an example, this will affect fire resisting, single core insulated wires e.g. with a mica tape layer, for which no cable design standard currently exists.

This standard also affects cables under BS 7629 Part 1. These cables are defined as 'electric cables 300/500V fire resistant screened cables having low emission of smoke and corrosive gases when affected by fire'. One of the test specifications within this standard is BS 6387.

BS 7846:2009, which is a design standard for armoured fire-resistant power distribution cables currently refers to the superseded issue of BS 6387:1994 as part of the test regime for 'F2' level of fire resistance. It appears likely that a future revision of BS 7846 will be changed to refer to the revised issue of BS 6387.

The problem arises if the cable is marked with BS 6387 and this is not dated. A cable manufacturer with BS 6387:1994 cannot claim it is BS 6387 if the cable has not been tested or certified to BS 6387:2013. It will affect all cable manufacturers including international manufacturers with approvals to the 1994 edition. They need to be aware of the

change whether they are selling into the UK or across the world. The knock-on effect is that if they are selling cables under BS 7629 specification they have to recognise that BS 6387 has changed.

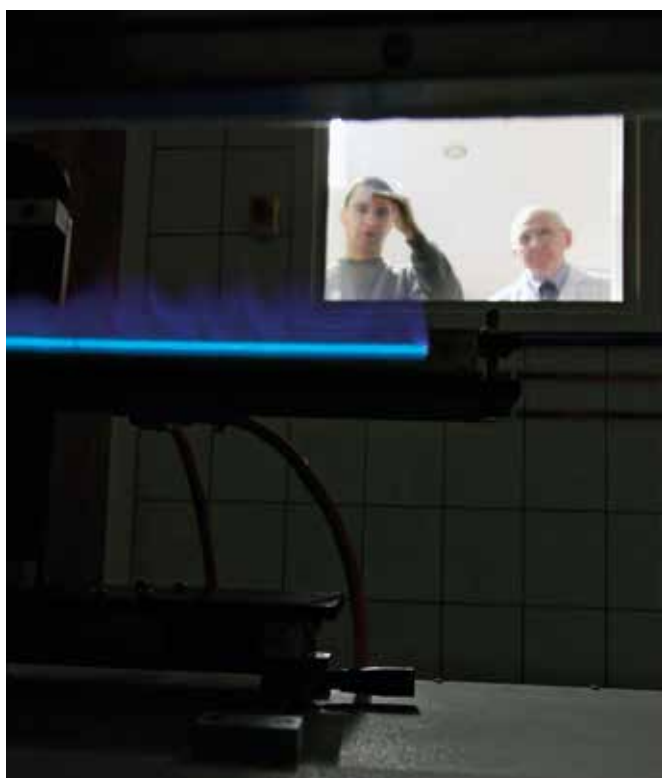
If the cable is BASEC (British Approvals Service for Cables) approved then the new test method, BS 6387:2013, will be used in follow-up surveillance assessments, so cable manufacturers will not have to worry. However, if the cable is tested or approved by another body and has previously been printed BS 6387 (undated) on the cable, then the manufacturer is advised to contact that body for advice.

In common with questions raised when other standards have been updated, industry participants from manufacturers to installers need to know whether the change renders existing stock unsaleable. Since existing stock would have been tested in accordance with the issue of BS 6387 prevailing at the time of manufacture, there is no reason not to use the stock until it is exhausted. Furthermore, as there are no technical differences between the performance categories C, W and Z between the 1994 and 2013 editions, there will be no changes to cable performance. However, again, a non-dated reference to BS 6387 on the cable is potentially misleading and should no longer be claimed. In all instances where there is some confusion, it is advised to speak to the test and certification body or trade association for advice relevant to the particular situation.

### BS 6387's Bigger Brother

As mentioned previously, BS 6387:2013 is applicable to cables of rated voltage not exceeding 600/1000V and not exceeding 20mm in diameter. In a real building however, the incoming power supply cables are likely to be much larger and less flexible, often armoured. Having developed BS 6387 for smaller cables, the British Standards committee also developed BS 8491:2008, for assessing the fire performance of power cables as components for smoke and heat control systems and certain other active fire safety systems within building to complete the fire-resistant system.

This standard is for the assessment of cables of the same voltage but greater than 20mm diameter. In order to accommodate these larger cables the



Images courtesy of BASEC

tests are not identical as those stipulated in BS 6387, however they still incorporate direct fire attack, mechanical shock and water spray, over various durations up to two hours. More severe fire tests have been and are being developed to assist architects and fire engineers in achieving higher levels of safety in buildings using active fire protection such as smoke control and extraction systems, which rely on continuity of power supply during a fire.

There has been controversy over the seemingly arbitrary cut-off for both BS 6387 (largest size) and BS 8491 (smallest size) at 20mm. BASEC has sympathy with manufacturers wishing to test smaller diameter cables to the more severe test, BS 8491, such as mineral insulated cables, and likewise for those wishing to extend BS 6387 to larger cables or cables with different designs that are currently excluded. However, these tests are aiming to provide reassurance about fire performance for two quite different groups of cables, respectively, lighter duty control cables and heavy power distribution cables. At the same time, architects, fire engineers and designers across the world are taking advantage of new technologies to produce innovative designs incorporating more elaborate layouts in buildings, and require more effective fire performance systems. As buildings become more complex in this

way, the need for higher performance cables has been identified by a number of manufacturers.

BASEC is frequently asked about 'low smoke halogen free' (LSHF, and many other similar acronyms) cables, and the requirements for this categorisation. To describe a cable as 'LSHF', it must generally pass two tests: (a) a smoke cube test, which sets a maximum accumulated smoke density produced when burning the cable with a standard fire, and (b) a corrosive and acid gas test (also referred to as assessment of halogens) where the cable materials are roasted in a tube furnace and must give off a maximum of 0.5 percent acid gas. These tests are both specified in the relevant cable standards that include the description 'having low emission of smoke and corrosive gases when affected by fire'. Cables made from PVC or similar halogenated materials are unlikely to pass these tests. A common misunderstanding is that an 'LSF' cable means it has only passed the smoke test and not the acid gas test. In reality, many of these marketing terms are essentially meaningless unless they are clearly associated with test requirements.

### CPR to Include Cables in Remit

Looking into the not too distant future we have a potential shake-up within

Europe when the Construction Product Regulation (CPR) is extended to include cables within its remit. At the present time CPR applies to many building materials, and is the construction industry's most significant change in how construction products are sold within Europe. From 1 July 2013, under the Construction Products Regulation (CPR) 2011, it became mandatory for manufacturers to apply CE marking to any of their products which are covered by a harmonised European Standard (hEN) or European Technical Approval (ETA).

This was a major change, as affixing a CE marking under the provisions of the previous Construction Products Directive (CPD) was voluntary. Once the CPR requirements become effective for cables, there will be additional requirements to a number of standards, including standards for fire resistant cables, to be aware of. Initially this will see new requirements and grading for reaction to fire. The inclusion of a further new test for fire resistant cables (P-class) is already well advanced, but this is unlikely to replace the need for standards like BS 6387 or BS 8491, which address specific local design and performance needs.

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# Innovations for Protecting Coal Handling Equipment

Safety, equipment protection, and business continuity are critical to the success of energy companies and, in this article a state-of-the-art smoke and gas detection system used to protect coal handling systems including conveyor systems, tripper galleries and silos is described.



**Claudio Groppetti**  
Pice President – Industrial  
and Manufacturing at Xtralis

Fundamental to protecting a system is the ability to detect a fire in its incipient phase, prior to its escalation and resulting equipment damage and process stoppage, without false or nuisance alarms. The use of early warning smoke and gas detection in these applications is supported by fire testing performed by National Institute for Occupational Safety and Health.

The new detection approach is able to detect incipient fires caused by spontaneous combustion of sub-bituminous coal, overheating of conveyor components such as belts, pulley, gears, or transfer boxes, as well as overheating of system controls and power cabling.

The benefits of the system include:

- Preventing equipment damage or process stoppage occurs due to the ability of detecting incipient fires.
- Proven and successful worldwide field performance protecting coal handling equipment and systems.
- Non-intrusive detection with the ability to service and maintain the system without process or work flow interruption.
- Simple maintenance and servicing of system
- Field configurability with ability to make adjustments for unique individual environmental conditions.

The need for establishing efficient and effective safety program is especially important when handling sub-bituminous ranked coal such as Powder River Basin (PRB) coal due to its propensity for spontaneous combustion. In addition to coal fires other fire sources exist and include overheating of conveyor

components such as belts, pulley, gears or transfer boxes, as well as overheating of system controls and power cabling. The earlier a fire can be detected prior to breaking out in open flame allows operators to take corrective action or activate automatic suppression to minimise and / or prevent the escalation of a fire and subsequent equipment damage and shutdown.

Very early warning smoke and gas detection has successfully been used to protect many commercial and industrial applications including; wood pellet processing facilities, steel processing facilities, utility tunnels, battery rooms, boiler feed pumps, variable frequency drive cabinets, maintenance and service facilities, along with traditional protection of control rooms, server rooms, cable spread rooms and motor control centres.

This paper will describe a very early warning smoke and gas detection system for the protection of coal handling equipment. The first deployment of this type of system in the United States occurred at a coal fired power plant burning PRB coal to protect a conveyor belt system and escape tunnel.

## The Application

Companies utilising coal conveyor systems and associated escape tunnels that handle and process sub-bituminous or bituminous grade coal are constantly in search of effective means of protecting their staff and equipment from the perils associated with potential fires and carbon monoxide exposure. This concern is compounded when Powder River Basin coal is involved due to its volatile nature.

The drivers for this safety system included the desire to protect plant

personnel from carbon monoxide poisoning and fire and the protection of plant facilities, equipment and processes.

Critical to the success of any safety system is the selection of the proper technology to detect the hazard. Heat detectors and their inherently slow response time make them unsuitable for incipient fire detection. Optical flame detectors are not able to detect the incipient phase of a fire because they require that the fire escalates to an open flame before responding. The presence of ambient lighting precludes the use of optical ember detectors. Conventional point smoke detectors are also not acceptable due to their inability to survive the environmental conditions present in a coal handling facility. Carbon monoxide detection is often used for the detection of deep seated oxygen deprived fires or incipient detection of PRB coal fires. The development of an industrial grade very early warning smoke and gas detection system offers a new detection alternative that delivers the benefits of both carbon monoxide detection and incipient smoke detection without false alarms.

Recent work reported by Perera and Litton is shown in Table 1 shows the ability of several different types of detection technologies to detect a wide range of burning material found in mining applications. Of particular interest for the coal conveyor application is the data reported on detection of both low volume and Pittsburg seam coal fires as well as SBR and PVC belt materials.

The data indicates that very early warning smoke detection can outperform carbon monoxide detectors for the detection of coal fires and conveyor belt material fires.

The unique ability to simultaneously detect carbon monoxide and smoke were significant facts that led to the selection of a combination aspirating smoke and gas detection system for the protection of the coal conveyor system and emergency escape tunnel.

## Very Early Warning Smoke & Gas Detection System

A typical very early warning smoke and gas detection system consists of four basic components: a sampling pipe network with a series of sampling holes, an aspirated gas detector, an aspirating

Burning material	Time to visible smoke, min	Time to visible flame, min	Smoke sensor time to alarm, min						AXONX video smoke	CO sensor time to alarm (10 ppm), min	
			Spero	Smoke Boss	Conspec smoke	VESDA	UL-approved combination smoke sensor			Conspec CO	Bulk Average CO
							Optical	Ion			
Douglas-fir	2.50	9.75	13.70	No alarm	8.10	7.53	N/A	N/A	6.46	8.30	8.23
Ponderosa pine-1	3.30	9.97	No alarm	No alarm	10.20	8.17	N/A	N/A	5.10	8.53	7.73
Ponderosa pine-2	3.66	13.08	No alarm	No alarm	6.80	4.93	4.40	6.10	5.73	7.00	5.23
Red oak-1	3.02	10.20	No alarm	No alarm	7.60	4.80	N/A	N/A	4.02	7.03	6.50
Red oak-2	3.88	13.00	No alarm	No alarm	8.13	5.63	5.10	5.10	5.92	8.57	6.90
Red oak-3	2.92	8.68	No alarm	No alarm	9.27	5.20	5.10	6.70	7.17	8.07	6.80
Pittsburgh seam coal-1	3.08	11.12	No alarm	No alarm	8.83	7.60	7.60	6.60	6.22	10.07	9.37
Pittsburgh seam coal -2	3.08	12.45	No alarm	No alarm	9.47	8.03	7.50	7.50	7.00	8.87	8.10
Low vol coal mixture-1	3.10	14.15	No alarm	No alarm	N/A	7.86	No alarm	9.83	11.36	11.76	10.53
Low vol coal mixture-2	3.03	20.10	N/A	No alarm	20.06	8.33	N/A	N/A	N/A	12.83	N/A
SBR belt-1	3.13	18.00	19.30	13.30	12.23	8.77	N/A	N/A	13.46	13.30	11.00
SBR belt-2	2.30	24.00	17.26	10.80	9.03	5.43	7.98	9.73	5.25	10.97	9.57
PVC belt	1.92	N/A	No alarm	9.96	9.03	4.80	5.10	6.50	3.63	12.90	12.83
Diesel fuel-1	N/A	0.50	N/A	No alarm	0.87	1.07	1.10	0.90	N/A	1.67	2.07
Diesel fuel-2	N/A	0.50	1.90	No alarm	0.70	1.07	1.20	0.80	N/A	1.20	1.17
Diesel exhaust	N/A	N/A	N/A	No alarm	4.03	2.23	No alarm	3.50	No alarm	4.36	4.63

smoke detector, and power supply with 24-hour battery backup. The aspirating smoke detector contains the aspirator that draws air sample from the area being protected, across the aspirated gas detector and into the aspirating smoke detector.

For this installation the sampling pipe was run at the ceiling over the entire length of both the conveyor belt line and escape tunnel. The technology enables the detectors to be located outside the area being protected. In this application, both the smoke detector and gas detector will be mounted near the entrance of the conveyor belt tunnel. This allows for easy and safe access for all testing, servicing, and maintenance without putting operators at risk or interrupting the process.

Inherent to an active aspirating system is the fact that the sampling network is continually drawing air samples from the detection space into the detection system while having its air flow monitored. Active sampling eliminates the inherent resistance of smoke or gas entering conventional point type smoke and gas detectors. It also ensures that the operator will be notified in the event that the flow is interrupted and not sure from undisclosed detect or failure due to detector contamination and clogging by the environment.

An active sampling pipe network also enables both the sampling and conditioning of air stream before it reaches the detectors. This enables use

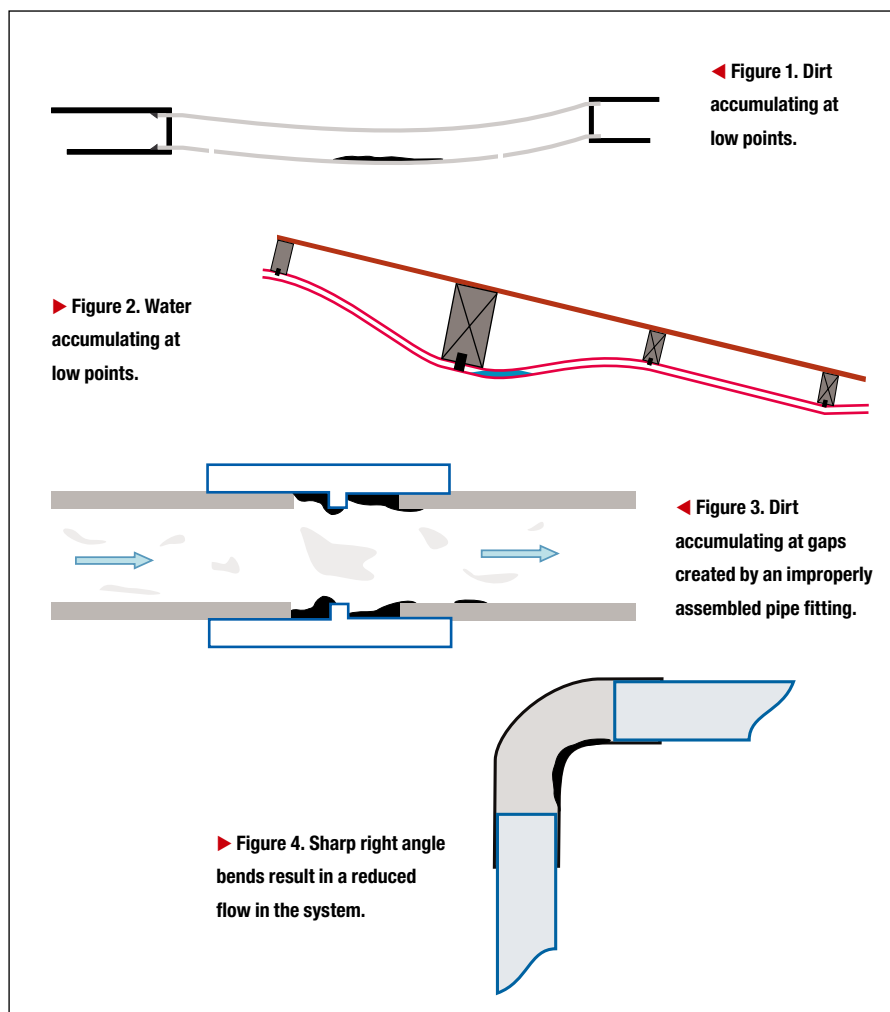
of the technology in harsh environmental conditions that would prove to be unsuitable for conventional fixed point smoke or gas detectors. The environments that are routinely handled include: dirty, dusty and wet environments, extreme temperatures, high vibration, and high EMI areas, as well as hard to access areas where machinery is continually operating.

Additionally, the need to hard-wire individual fixed point smoke and gas detectors in the detection area can be eliminated by simply installing a plastic pipe network with drilled sampling holes in the area and drawing the gas into the detector located outside the space. System design tools and guidelines are available to assist and confirm that the design meets all the requirements for proper operation with the gas and smoke aspirating detectors. The aspirating smoke detector used in this application was specifically designed for use in industrial environments.

A few of the key features of this detector include:

- The ability to protect the optical detector surfaces from contamination.
- Multiple alarm thresholds that alert operators to "off-normal" conditions so that the alert can be investigated before a fire escalates and caused damage
- The ability to adjust alarm thresholds above ambient background levels so that false alarms are prevented.
- An industry-first fully monitored fail safe filter technology.





- The ability to re-zero the product in the field to extend the detector's life.
- Extended sample pipe distances.
- A NEMA 3/IP54 protective enclosure.
- A modular design that allows for field replacement of individual detector modules.

## System Installation & Commissioning

The ability for a system to perform properly is highly dependent upon its being installed properly. The following information describes a few installation techniques that will help ensure a good industrial installation. For a complete set of installation guide lines the reader is referred to the published literature available to the market from industrial aspirating smoke and gas detection manufacturers.

The installation techniques that will be discussed include sampling point/hole profile, proper sample pipe installation to prevent the build-up of dirt, contamination, and water/condensation, as well as methods to keep the sampling pipe network clean.

When it comes to installing the pipe network, care must be taken to ensure that contamination, water, or condensation does not accumulate in the pipe network. Care must be taken to ensure that there are no low spots where dirt and water can accumulate as shown in Figures 1 and 2.

Figures 3 and 4 show how dirt can accumulate at gaps created by an improperly assembled pipe fitting or when sharp right angle bends are used ultimately resulting in a reduced flow in the system.

Another method to deal with water or condensation that enters into the pipe network is to use a water trap and coalescing filter.

There are industrial environments where dirt and contamination will inevitably enter into the sampling pipe network. There are methods and techniques that can be deployed to minimise or prevent unacceptable levels of dirt from entering the pipe network. This involves utilisation of a back-flush or blow-back system that is accomplished

by inserting a set of valves or a three-way valve in front of the detector. Periodically the detector is isolated from the pipe network by closing a valve followed by opening a second valve and purging the system with low pressure instrument air or dry nitrogen to flush contaminants out of the pipe network. Another method that can be used instead of the blow back method is to vacuum the pipe using a small shop vacuum. A combination of vacuuming the system first, followed by blowing the system out is also a viable technique. The frequency of cleaning the pipe network is dependent upon the actual environment being protected.

## Summary

A combination aspirating smoke and gas detection system has been described that is being used to protect a coal conveyor system and emergency escape tunnel in a coal fired power plant using Powder River Basin coal. It will be capable of detecting carbon monoxide and smoke from either the incipient stage of a PRB coal fire or incipient fire occurring in the conveyor belt system.

The system uses a sampling pipe network that is mounted to the ceiling of both the conveyor belt system and escape tunnels. Both smoke and gas detectors are located at the end of the sampling pipe run at the entrance of the facility to facilitate easy servicing and maintenance. The advantages of this system include:

- The ability to protect the optical detector surfaces from contamination.
- Multiple alarm thresholds that alert operators to "off-normal" conditions so that the alert can be investigated before a fire escalates and caused damage.
- The ability to adjust alarm thresholds above ambient background levels so that false alarms are prevented.
- An industry first fully monitored fail safe filter technology.
- The ability to re-zero the product in the field to extend the detector's life.
- Extended sample pipe distances.
- A NEMA 3/IP54 protective enclosure.
- A modular design that allows for field replacement of individual detector modules.

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# Do I Really Need Training to Service a Portable Extinguisher?

Working in the fire industry we are all acutely aware of the need for our products or services, and that we are working to protect lives. Portable Extinguishers are firmly placed on the front line of life protection and while there is a trend in some areas to remove them in favour of automatic systems and evacuation, their importance should not be underestimated.



**Ian Gurling**

Training Manager at the  
Fire Industry Association

With that in mind the portable extinguisher technician holds responsibility for people's lives through ensuring that the right extinguisher is available according to the risk and that it will function if it should be needed.

If that was not enough, ensuring the technician gets it right is current legislation (The Regulatory Reform (Fire Safety) Order), technician and third-party certification schemes such as the offerings from BAFE and of course guidance documents such as BS5306, so how does the technician make sure they can comply with this? In short, training!

So let us boil it down to basics; what does the technician get on the training course? He needs to know and understand the physics of fire from the causes and process of combustion through to extinguishing; he needs to understand flammable materials and extinguishing media and he needs to understand what happens when any from the wide range of extinguishing media are applied to a fire and how they will react with materials they come in to contact with.

The technician needs to understand how to read a risk assessment and estimate the potential scale of a fire before selecting the extinguisher(s) for the risk (such as using a water extinguisher on a Class F fire or installing an extinguisher too small for the quantity of combustibles held); they need to understand the construction of portable extinguishers. Servicing a stored pressure extinguisher, for example, has

obvious and inherent risks to personal safety when stripping, and if not correctly returned to a functioning condition, including pressurisation, the extinguisher may fail should it be required. The technician also needs to understand his customer and how to ensure that the customer understands and fulfils his individual requirements.

Most of what is required can be gained through training courses such as those offered by the FIA. BS 5306 does state who it recognises as the exam providers and so your training provider must lead on to completion of the recognised examination. During the period of learning the key to a good course is one that develops understanding of the subject and does not just 'teach to repeat' what has been said on the day. If your training provider simply gives the answers to the examination paper the technician has not developed the understanding necessary to apply what they have learnt to varied situations.

That is where respected and established training providers such as the FIA come in. As a benchmark, the FIA course provides three days of comprehensive learning followed by the BAFE examination on day four. Over the three days of learning the technician will cover both the theory of parts 3 (servicing and maintenance) and 8 (supply and distribution) of BS 5306 and for the practical element carry out stripping, inspecting and reassembly of a range of portable extinguishers. Learners are encouraged to think for themselves and with daily assessment of progress





any difficulties in understanding or interpretation of the standard are quickly addressed giving the learner the greatest possible chance of success on the examination.

Day four for the FIA is examination day; for this we use BAFE. As administrators for the Competent Technicians Scheme it is felt that the BAFE is best placed to conduct the examination; it has a comprehensive understanding of what is required for entry to the scheme and as such will have similar understanding of testing that knowledge. Examiners from BAFE will attend to invigilate a two-hour paper and carry out one-to-one practical assessment.

Herein lays the need for the training provider to understand the learner. For many, a two-hour examination paper and one-to-one assessment is a daunting enough task, but in an industry where practical skill often outweighs academic ability, technicians attending occasionally have learning difficulties or dyslexia and their abilities have to be recognised to the same level as the more academic. To that end, with good communication between learner and training provider, facility can be put in place to allow for coping strategies. In some cases extra costs will be applied to the learner or his employer (such as in the event a scribe is required, which cannot be someone directly connected to the learner), however allowing extra time or printing in specific typefaces or on coloured paper will help for no extra cost, giving all learners the best opportunity to pass.

The British Standard also

recommends refresher training, a fact repeated in the requirement for competent technician schemes. It is intended that refresher training be completed every three years. Unfortunately the transient nature of the portables industry and individual demands on the technician means that regular refresher training may either not be possible or simply left for extended periods beyond the recommended timescale (if periods between training and refresher become too extended a four-day course may once again be required).

To ensure that the learner on refresher training gains the most benefit and is brought up to date with developments in technology, changes to standards and current best practice, the trainer needs to understand the baseline from which to instruct. To do this the FIA refresher course starts with a simple assessment identifying levels of knowledge and understanding among the group. From there the trainer is able to tailor the course to the needs of the group. In one day of learning the trainer will then bring all of the learners up to date and compliant with current scheme, standard and legislative requirements.

Going back to the original question: do I really need training to service a portable extinguisher? For the individual, philanthropic conscientiousness (stated above) is just one aspect of the need for training and if every person working in the industry held the same social conscience there would be no requirement for legislation or third-party certification schemes. However making sure that

portable extinguishers are maintained to a consistently high standard requires measures of control.

As I have already mentioned third-party certification schemes, I will start there. It is hard to argue in favour of third-party certification when there is no legislation requiring certification that leaves businesses and individuals working commercially without it subject to criminal prosecution, as is the case for gas engineers. We also know that without the cost of registering on such a scheme businesses have the scope to undercut prices, which in an industry where margins are very small the attraction to not hold third-party certification become quickly apparent.

Third-party certification works for both the individual technician and for the company employing him. It provides an easy point of reference to the end user that the company and individual being used knows what he is doing, has the relevant and comprehensive support systems in place and the right tools for the job. It ensures that the service provider works to a recognised base standard (most companies will provide their own levels of added value to this standard in order to stand out from their competitors), which ensures the end user knows what they should expect.

Commercially, it makes sense to hold third-party certification; it is easy for any of us to make the statement that we can do something but harder to provide evidence proving it (I frequently claim to be able to service my car but would not be able to sell that service as there is much I have not a clue how to do as



Image courtesy of Fire Industry Association

I have never been trained). Third-party certification provides that evidence. Training forms one important aspect of third-party certification, the company cannot be awarded certification without competent technicians, subsequently the technician cannot be deemed competent without recognised and current training (forming just one aspect of the certification requirements).

Going a stage further, we have legislative requirements. The Regulatory Reform (Fire Safety) Order (RR(FS)O) states that there must be a Responsible Person (RP) for the fire safety of the premises (I paraphrase and identification of the RP is not simply a case of putting it in to an employee's job description) and that the RP has to, in turn, employ Competent Persons (CP) to provide advice and carry out the work on the fire safety systems within their area of specialisation.

It is highly unlikely that the CP will remain the same person for all systems within the fire safety programme and the RP has to be able to confirm the CP's claim to be competent. The best and easiest way to demonstrate competence is through third-party certification.

To date the term competence has not been defined by law and so it is assumed by the fire industry to be a combination of experience, the right tools for the job and, of course, training. With all of these in place the technician can have the confidence to stand up in court and say yes I am competent (assuming they were working within the limits of their specialisation, it would be no good claiming competence in fire doors if specialisation is limited to portable extinguishers). Even easier and backing up the claim would be a certificate claiming that they have been independently audited and certificated by a third party.

**Returning once again to the original question: do I really need training to service a portable extinguisher? Yes you do!**

As with many apparently simple tasks the layman or untrained individual may be tempted to do it himself, however key aspects of safety may be inadvertently missed, aspects of fire risk could be omitted or misinterpreted, and as a result in the event of a fire the portable

extinguisher may prove to be insufficient or worse completely wrong for the nature of the fire. If the extinguisher or its provision should fail then lives are put at risk and potentially lost, even if the company policy on extinguisher use is not to fight the fire but to aid escape.

In the subsequent enquiry and possible court case the competence of the service technician is called into question. The most effective defence in court is third-party certification, which is recognised in the fire industry as the easiest means of demonstrating competence due to its nature of independently auditing the training, experience tools and processes held by the technician. Otherwise the technician has to be able to effectively stand in court and say, yes I knew what I was doing, carried out the service according to current guidance, industry best practice and legislation and ensured that the portable extinguisher provision was correct to the identified risk and in accordance with the company's fire risk assessment.

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# Embracing Modelling for Design Safety

A release of a flammable gas or liquid following loss of containment in the process and oil and gas industries has a significant likelihood of ignition. The outcome after ignition depends on the fuel type, the amount of fuel, the surrounding air, confinement, and the time of ignition.



**Prankul Middha**

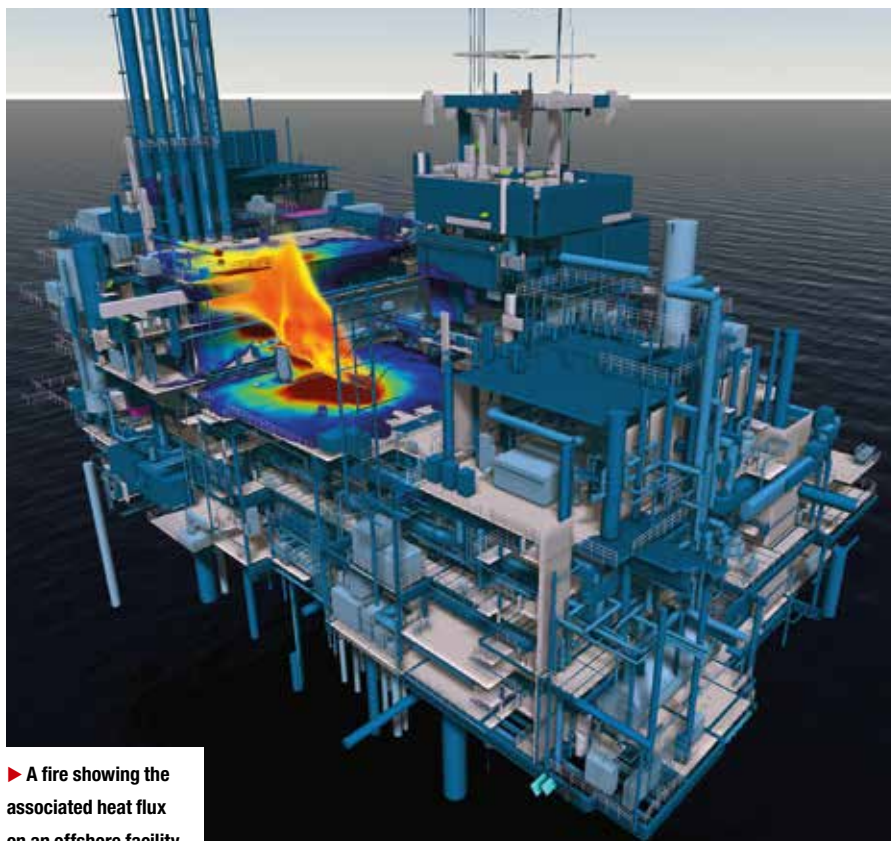
General Manager  
Consulting at GexCon UK

The worst case scenario will always be a major explosion, as it can lead to catastrophic damage and follow-on events such as fire and a boiling liquid expanding vapour explosion (BLEVE). The consequences of a fire – for example a jet fire following immediate ignition of a high pressure release – are usually less severe, but this is compensated by the fact that fires happen more frequently than explosions. Accidental fires represent a significant hazard to people, property and the environment. The risks related to fires are exposure to heat, toxic gases, lack of oxygen, and blockage of escape routes due to smoke or poor visibility.

Materials change their properties

when the temperature increases and this can result in serious damage or collapse of entire structures. According to data, the tenability limit for people is approximately 2.5 KW/m<sup>2</sup> and a heat dose of 2000 (KW/m<sup>2</sup>)4/3s has the probability of fatality of 50 percent. However, most fire deaths are not caused by burns, but by smoke inhalation. Smoke contains toxic chemicals such as carbon monoxide, and a concentration of just 1.28 percent leads to death within two or three minutes.

Historically, fires and / or explosions have been responsible for a very large part of the losses within the oil and gas industry. Designing key safety critical elements (SCEs) to withstand the consequences



► A fire showing the associated heat flux on an offshore facility.

Image courtesy of GexCon UK

of hydrocarbon fires, as well as reducing the risk of escalation, is an important aspect in the design of oil and gas facilities since it is impossible to completely eliminate the risk of catastrophic events. Therefore, it is necessary to accurately determine the consequences of fires on any oil and gas or process facility and use that as an input to new design.

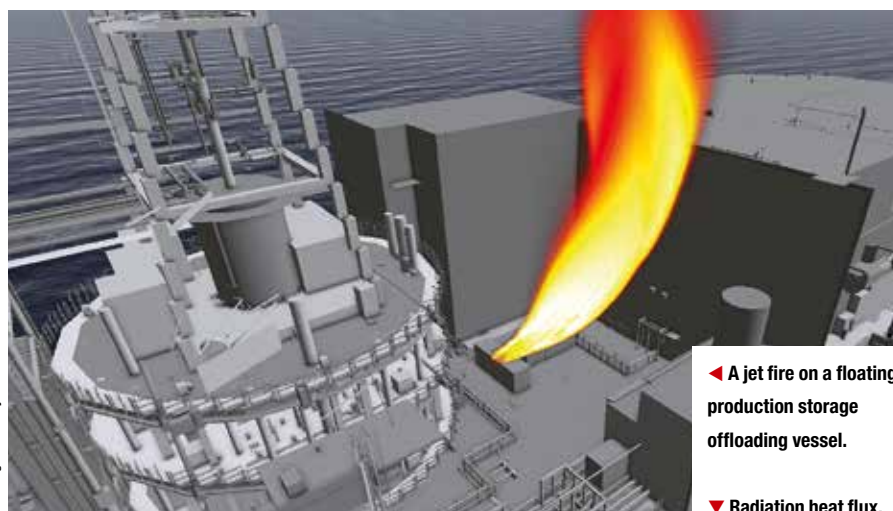
### Why Use CFD for Fire Modelling?

During the past 30 years, the use of advanced computational fluid dynamics (CFD) for explosion simulation, particularly for offshore installations, has become the industry standard; but this is not the case for fire modelling. Even in the North Sea, which is one of the most tightly regulated oil and gas regimes, CFD is generally used only sparingly for fire modelling in the UK sector as it is perceived that simpler tools can provide sufficiently accurate representation of the consequences of fire.

However, for a realistic numerical prediction of fire, the complex interaction between turbulent flow, buoyancy, convection, entrainment of air, non-premixed combustion, soot formation, thermal radiation, fluid structure interaction, dispersion of smoke and toxic combustion products, and effects of mitigating measures need to be modelled. These processes also have significantly different time and spatial scales that make the modelling even more difficult. There is a large influence of the complicated geometry present in the oil and gas facilities that needs to be accounted for. Simple models do not have the capability to represent all the important phenomena.

CFD simulations have traditionally been perceived as high cost in terms of computation needs as well as the time required for defining all the necessary geometry and scenario parameters. With the advent of new software tools, ever-faster desktop computers and improved user interfaces, more advanced fire simulation models are becoming more accessible to a wider range of fire safety engineers.

The use of simplified models would be expected to be 'conservative' and provide a solution that is safe. However, that may not always be ideal as over-conservative solutions can lead to their own problems. Let us consider the example of passive fire protection (PFP) in the oil and gas



Images courtesy of GexCon UK

◀ A jet fire on a floating production storage offloading vessel.

▼ Radiation heat flux.

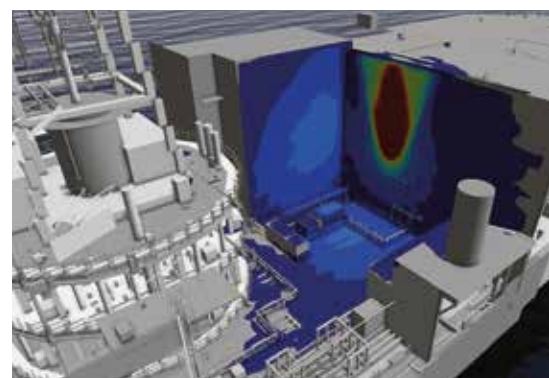
industry. The aim of applying PFP to structure and process equipment is to allow safe evacuation time of personnel and for firefighters to deal with the fire. By preventing escalation, the implementation of PFP helps protect people and assets.

However, PFP increases the risk of corrosion and leak frequencies from process equipment. PFP also increases the dimensions of equipment, which causes a rise in explosion design loads. Adding PFP also increases the total weight of the installation and increases the installation and maintenance costs of the facility. Therefore, it is necessary that only the optimal amount of PFP is used. CFD modelling provides more accurate recommendations for the PFP requirements and results in a design that is more cost-effective, while still maintaining the required safety.

Thus, CFD simulations are recommended for many aspects of fire safety engineering, including escape route studies and PFP optimisation. However, it is critical that any CFD fire model is thoroughly verified and validated by comparing the results with experimental data before it can be accepted as 'virtual reality' by the regulatory authorities. Once a tool is validated in such a manner, it is the only viable alternative for the investigation of fires in a realistic environment where it is not possible to perform experiments.

### A New CFD Code for Modelling of Fire Consequences

All incidents in the oil and gas industry involving hydrocarbons typically begin with a loss of containment, before escalating to a fire or explosion. The main goal of modelling of such scenarios is to be able to



characterise the consequences of such an event. As explosions have been perceived to be more catastrophic, the application of CFD modelling for the purpose of simulating gas explosions is currently much larger compared to that for fire modelling.

However, as described above, CFD modelling is also recommended for accurate determination of consequences of fires. One of the ways of increasing the penetration of CFD modelling for analysing fires is to provide a CFD tool that can reliably simulate the entire chain of events, starting from release, ventilation, dispersion, explosion, and fire. This has been a motivation for the R&D team within GexCon for the development of FLACS-Fire.

FLACS-Fire has its origins in the CFD tool FLACS that has been developed through a series of joint industry projects that began in 1980.

The key motivation for the oil and gas industry since that time has been an understanding of explosion phenomena and designing protection and mitigation measures for gas explosions.

The FLACS tool, which has been thoroughly validated against available experimental data, has assisted in





◀ Petrochemical facilities are among the highest hazards.

order to account for the various scenario variables such as fire obstruction by geometry, leak characteristics and weather conditions. The results from the CFD analysis can be coupled with other more advanced programmes that simulate the material response to heat loads for this purpose (more advanced non-linear finite elements analysis). This can give a much more precise recommendation for a fire DAL load and also for designing protection measures for the SCEs and other key structures.

This can assist in designing both active fire protection (AFP); for example, fire detection and sprinkler systems and passive fire protection. Firewalls between such as process and utility areas, can be appropriately dimensioned. CFD modelling of smoke and hot exhaust gases can provide a reliable estimate of the potential for impairment of escape routes and assist in emergency evacuation planning. Optimum design of protection measures such as PFP saves both installation and maintenance costs, and can also lead to a more stable design, with less weight.

### Balancing Act

The extensive use of CFD allows the inclusion of various affecting parameters such as fire interaction with geometry, release characteristics and weather conditions. The calculated incident heat loads are then used to assess whether the system would withstand the heat without protection or implementation and where the increase of PFP is required according to a specific performance requirement.

However, CFD simulations are time and resource intensive. Therefore, a 'hybrid' approach may be recommended where simplified tools are used for screening the scenarios and only those scenarios that are expected to drive the fire risk are analysed more properly using CFD modelling. A proper use of consequence models can lead to more optimal design of process for oil and gas facilities that not only improves the safety performance but is also cost-effective.

**For more information, go to  
[www.GexCon.com](http://www.GexCon.com)**

achieving this goal. The development has included rigorous model implementation based on fundamental phenomena but also engineering considerations to allow for the application in realistic process facilities. The same approach has been followed for FLACS-Fire.

The model development has included a new combustion model, a much more extensive model for radiation, and a new soot model. Most fire scenarios involve non-premixed or diffusion flames. For most fires, the combustion rate is controlled by the mixing of fuel and air, and simple mixed-is-burnt (MIB) combustion models can be applied. However, a preferred model is the eddy dissipation concept (EDC) that includes the interaction between turbulence and chemistry. It allows for both an infinitely fast and detailed chemistry to be applied, and extinction can be modelled.

Thermal radiation plays a vital role in overall heat transfer in applications including fire simulations. Thus, in carrying out CFD and other simulations, an accurate modelling of the radiation is required. FLACS-Fire solves the continuity, momentum, and enthalpy – the internal energy plus the pressure time – equations. Solving this enthalpy equation requires a radiative source term. The governing equation for describing radiation intensity field in an absorbing, emitting and scattering medium is the radiative transfer equation (RTE). The governing radiative transfer equation is rather complex, which makes the analysis difficult and computationally expensive.

The discrete transfer method (DTM) is one of the widely used methods to

solve radiative transfer problems with participating medium. It combines advantages of the Monte Carlo method, flux methods and zonal methods. One advantage is that this method can be used to calculate the intensity distribution in arbitrary shaped, three dimensional complex geometries.

The discrete transfer method is based on solving the RTE for some representative rays fired from the boundaries and solid surfaces in the domain. Rays are fired from solid surface boundaries and traced through the volume. At the boundaries, radiative heat transfer boundary conditions are used to determine the intensity of rays fired from that surface area. A well-predicted soot level is important for heat transfer by radiation. Soot is a difficult phenomenon within combustion science, due to the lack of knowledge about the soot formation and growth. Both simplified and detailed models are found in the literature.

The recommended model is the Formation-Oxidation model that includes two source terms in the transport equation for soot. One term models the formation of soot and the other models the oxidation (combustion) of soot. The models can be applied for simulating both jet and pool fires. These have been validated against a wide range of experimental data.

### Application Areas

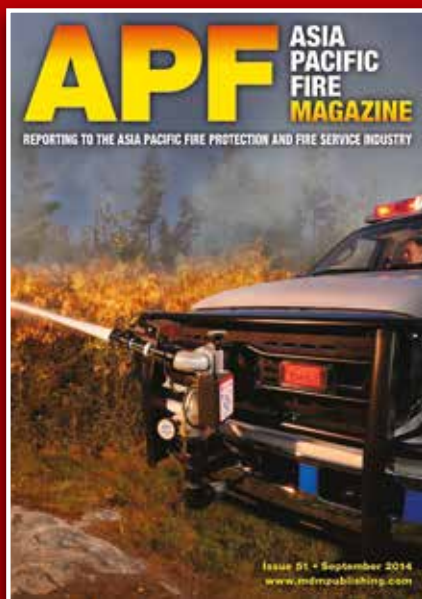
CFD simulations of fire events can provide a much more accurate estimation of the consequences of fires in case of an accidental event. CFD simulation tools are used rather than simplified models and empirical correlations in





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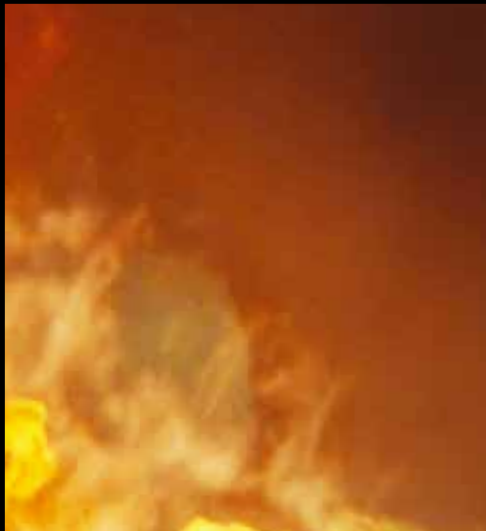
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